[illegible]

ELEMENTARY

ARITHMETIC

4016

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29

Wm R. Jackson

Wm R. Jackson

400 J. M. Carter

250 J. M. Jackson Head Master

410 Grammar Public School

200

J. M. Jackson Ontario Ca.

300

292

592

16

5

21

147

48

195

7065009

8506050

60708

108059

9306005

630

70010

20116466

59,103,009

648 017

6,305 906

701 015

36 036 805

15 015 015

10 001 010

127,810,777

506,073,901

72,700,709

501 105 051

7 007 007

93 980 009

50 005

603 036

700 000 000

1,881,470,018

709 300 030

199 909 708

909 390 322

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

256438
469526
378725
987654
532936
874567
479846

[illegible]829
264738
957645
378372
598873
487867
3520387

456789
382861
548692
178361
25369
47854
80219

15486
78325
46789
38738
74352
53640

98874
56789
12345
67898
36789
267695

8758
2638
6421
8678
5689
272119

932040674
236040769
695999905

7643692865
3456738625
4386954240

8736000432
1236000433
7499999999

9000000000
1000000001
7999999999

7328694325843
[illegible]
94973 [illegible]

6734870685
1349670627
5385200058

86934832
66764395
34538789
87692875
48234569
87629587
12345678
23456789
449597514

57895632
48769407
32687489
67925418
75932624
53254768
73628964
27965487
470989789

9638745
2887697
0736787
9287139
3456789
5287695
2743867
8729354
4526833

576328
362495
688764
567483
295834
[illegible]
[illegible]

41 5'71
[illegible]

KEY

TO

ELEMENTARY ARITHMETIC,

FOR

CANADIAN SCHOOLS,

BY

REV. BARNARD SMITH, M.A.,
St. Peter's College, Cambridge,

AND

ARCHIBALD McMURCHY, M.A.,
University College, Toronto.

TORONTO:
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1871.

65868743
41839652
32456789
57654321
91234567
65432198
78912345
43219876
506118491

123456789
876543210
901234567
654321098
789012345
432109876
567890123
210987654
345678901
4901234563

Entered according to Act of the Parliament of Canada, in the year One Thousand Eight Hundred and Seventy-one, by Copp, Clark & Co., Toronto, in the Office of the Minister of Agriculture.

98765432
45678901
32109876
89012345
76543210
23456789
10987654
67890123
54321098
498765428

Read	25
Writing	27
Draw	17
Spelling	28
Grmr	40
Hist	45
Geog	34 -16
Phys	40
Liter	30
Geom	120
Arith	150
	556

KEY TO

ELEMENTARY ARITHMETIC.

Ex. VI. (p. 17.)

(6)
6
7
6 + 1 = 7
7 + 2 = 9
—
29 boys.

(7)
2
2 + 2 = 4
4 + 2 = 6
—
12 years.

(8)
A's 2
B's 5
C's 7
D's 9
—
23
If C had bought 7 more.
—
30 total.

Ex. VII. (p. 19.)

(36)
19
17 + 19 = 36
36 + 9 = 45
—
100 marbles.

(37)
32 men.
65 + 32 = 97 women.
32 + 97 = 129 youths.
29 infants.
—
287

(38)
659 1st
657 + 231 = 888 2d
892 3d
2437 + 11 = 2448 4th
4885 5th
——
9770 total.

(39)
$9080 wife's share.
$11788 two younger sons' share.
$10600 eldest son's share.
$10600 three daughters' share.
——
$42068

(40)
589 1st
215+589 = 804 2d
197+589 = 786 3d
589+786 = 1375 4th
——
3554

Ex. VIII. (p. 21.)

(21)
24916
51954
27499
37750
44720
——
186839

(22)
15499
6824
29620
20325
——
72268

(23)
44821
90323
19096
14669
13743
11555
——
194207

Ex. IX. (p. 22.)

(14)
44 sheep.
35 cattle.
15 pigs.
6 horses.
——
100 animals.

(15)
523 bu. wheat.
120 " oats.
64 " peas.
237 " potatoes.
38 " turnips.
——
982 total.

(16)
$1650
160
575
200
600
——
$3185

(17)
25211
32050
31183
28590
23780
24988
——
165802

Ex. X. (p. 25.)

(30)

$560	$300
300	260
$260 w'th of carriage.	$ 40

(31)

75	47
28	28
47 No. of boys.	19

(32)

49 + 65 + 19 = 133
167 − 133 = 34
65 − 34 = 31

(33)

6 + 4 = 10
6 − 4 = 2
10 − 2 = 8

(34)

10 + 3 + 8 + 5 + 3 + 4 = 33.
40 − 33 = 7.

Ex. XI. (p. 26.)

(22)

9277 − 1283 = 7994 2d In.
9277 + 7994 = 17271
23257 − 17271 = 5986

(23)

23047	10000
175	8406
23222	1594
368	704
22854	890
495	7305
23349	8195
132	
23217	

∴ the difference is 23217−8195=15022.

(24)

1869
1819

50 the age of the queen *now.*
1841
50

1891 when the prince's age = the queen's.

1891−1819=72 years, the queen's age *then.*

(25)

97 − 29 = 68 Henry's marbles.
97 + 68 − 25 = 140 Charles' marbles.

(26)

$$\begin{array}{rr} & 84 \\ & 135 \\ & 39 \\ & 58 \\ 39+58= & 97 \\ & 804 \\ \hline & \$1217 \end{array}$$

\$1217 – \$1000 = \$217 in debt.

(27)

45 – 16 = 29
29 + 7 = 36
36 – 10 = 26
26 + 2 = 28
28 + 4 = 32
32 – 11 = 21
21 + 9 = 30
30 – 7 = 23
23 – 5 = 18
18 + 8 = 26th from top.
45 – 26 = 19th from bottom.

(28)

63 – 5 = 58 children.
105 – 58 = 47 able-bodied.
70 – 47 = 23 infirm.
5 officers.

(29)

1769 – 1696 = 73 eggs.
1262 – 73 = 1189 nuts.
73 + 1189 = 1262
1769 – 1262 = 507 oranges
1189 – 507 = 682

(30)

$$\begin{array}{r} 117986 \\ 72268 \\ \hline 45718 \end{array}$$

(31)

$$\begin{array}{r} 45003008 \\ 37906703 \\ \hline 7096305 \end{array}$$

(32)

Since minuend = sum of subtrahend and remainder,
∴ min. = 56212300 + 77313 = 56289613.

(33)

Since subtrahend = difference bet. min. and remainder,
∴ sub. 66304000 – 12586 = 66291414.

(34)

Gained \$1 per head.
Total gain \$305.
∴ Actual gain = \$305 – \$45 = \$260.

(35)

$$\begin{array}{r} \$43054836 \\ 34717248 \\ \hline \$8337588 \end{array}$$

Ex. XII. (p. 28.)

(1)

3 = III; 18 = XVIII; 59 = LIX;
7 = VII; 25 = XXV; 62 = LXII;
11 = XI; 28 = XXVIII; 77 = LXXVII;
9 = IX; 37 = XXXVII; 84 = LXXXIV;
12 = XII; 40 = LX; 103 = CIII;
16 = XVI; 53 = LIII; 157 = CLVII;
190 = CXC; 200 = CC;
651 = DCLI; 783 = DCLXXXIII;
1204 = MCCIV; 1527 = MDXXVII;
1865 = MDCCCLXV.

(2)

III = three, or 3; VI = six, 6;
VIII = eight, or 8; XIII = thirteen, or 13;
XV = fifteen, or 15; XVII = seventeen, or 17;
XX = twenty, or 20; LIV = fifty-four, or 54;
LXXXI = eighty-one, or 81;
CXI = one hundred and eleven, or 111;
DCV = six hundred and five, or 605;
$\overline{\text{V}}$II = five thousand and two, or 5002;
$\overline{\text{MC}}$ = one million one hundred thousand, or 1100000;
MM = two thousand, or 2000;
DCCXLIX = seven hundred and forty-nine, or 749;
MDCCCLXV = one thousand eight hundred and sixty-five, or 1865.

Ex. XIII. (p. 31.)

(45)

39 × 11 = 429 bu.
429 × 6 = 2574 s.

(46)

21 × 12 = 252 pence.
252 × 3 = 756 pence.
252 × 7 = 1764 pence.
252 × 12 = 3024 pence.

(47)

11 × 23 = 253 cents.
33 × 9 = 297 cents.
297 − 253 = 44 cents.

(48)

12 × 12 + 8 = 152.
8 × 12 + 12 = 108.
152 − 108 = 44.

(49)

57 × 12 + 5 = 689 B's share.
112 × 12 + 11 = 1355 C's share.
259 × 12 + 9 = 3117 D's share.
689 + 1355 + 3117 = 5161.
7401 − 5161 = 2240 E's share.
2240 − 1355 = 885.

Ex. XIV. (p. 32.)

(18) 1st travels 93 miles per day, and 2d 79; therefore, in one day he gains 93 − 79, or 14 miles, and in a week, or seven days, he would gain 14 × 7, or 98 miles.

(19) At the end of two days, the first will have gained 14 × 2, or 28 miles; then second travels in an opposite direction 5 days, or 5 × 79 miles = 395, while first is traveling from him 5 × 93 miles, or 465 miles. Therefore, whole distance apart at the end of 7 days = 28 + 395 + 465 miles = 888 miles.

Ex. XV. (p. 34.)

$$\begin{array}{r}(19)\\495\\370\\\hline 34650\\1485\\\hline 183150\end{array}\qquad\begin{array}{r}(20)\\690\\480\\\hline 55200\\2760\\\hline 331200\end{array}\qquad\begin{array}{r}(21)\\417\\739\\\hline 3753\\1251\\2919\\\hline 308163\end{array}\qquad\begin{array}{r}(22)\\278\\900\\\hline 250200\end{array}$$

$$\begin{array}{r}(23)\\904\\803\\\hline 2712\\7232\\\hline 725912\end{array}\qquad\begin{array}{r}(24)\\3259\\497\\\hline 22813\\29331\\13036\\\hline 1619723\end{array}\qquad\begin{array}{r}(25)\\15900\\3300\\\hline 477\\477\\\hline 52470000\end{array}$$

(26)
50738
9706
304428
355166
456642
492463028

(27)
86370
90900
77733
77733
7851033000

(28)
47672
5126
286032
95344
47672
238360
244366672

(29)
68190
2065
340545
408654
136218
140645085

(30)
45094
7838
360752
135282
360752
315658
353446772

(31)
56888
6049
511992
227552
341328
344115512

(32)
92035
8007
644245
736280
736924245

(33)
84009
7898
672072
756081
672072
588063
663503082

(34)
678000
876000
4068
4746
5424
593928000000

(35)
90058
90009
810522
810522
8106030522

(36)
80108
7770
560756
560756
560756
622439160

```
    7039
    4709
   -----
   63351
 49273
28156
--------
33146651

   87900
    9006
  ------
   5274
7911
---------
791627400
```

(37)

```
      3910
    350000
  --------
  1955
1173
----------
1368500000

        7008005
         400703
        -------
       21024015
     49056035
  28032020
  -------------
  2808128627515
```

(38)

```
Sum  of 496 and 312 =  808
Diff. of 496 and 312 =  184
                        ---
                       3232
                      6464
                      808
                      ------
                      148672 product.
```

(39)

```
(1)  973      973
      63        3
    ----     ----
    2919     2919
   5838         3
   -----     ----
   61299     8757
                7
             ----
            61299
```

```
(2) 33000      33000
     1560         13
    -----     ------
     198         99
    165          33
    33        ------
   --------   429000
   51480000        5
             -------
             2145000
                   4
             -------
             8580000
                   6
            --------
            51480000
```

(40)

1263	5613	96732	67628
3	2	3	2
3789	11226	290196	135256
2	3	4	4
7578	33678	1160784	541024
6	9	6	8
45468	303102	6964704	4328192

Ex. XVI. (p. 84.)

(1)	(2)	(3)
78689	275832	729817
547	476	6736
550823	1654992	4378902
314756	1930824	2189451
393445	1103328	5108719
43042883	131296032	4378902
		4916047312

(4)	(5)	(6)
46481	40930	9264397
936	779	9584
278886	36837	37057588
139443	28651	74115176
418329	28651	46321985
43506216	31884470	83379573
		88789980848

```
     (7)
    6707936
       9878
-----------
   53663488
  46955552
 53663488
60371424
-----------
66260991808
```

```
     (8)
    6078908
       6725
-----------
   30394540
  12157816
 42552356
36473448
-----------
40880656300
```

```
         (9)
     708670567
         97806
--------------
    4252023402
  5669364536
 4960693969
6378035103
--------------
69312233476002
```

```
    (10)
    6835675
       2689
-----------
   61521075
  54685400
 41014050
13671350
-----------
18381130075
```

```
      (11)
    27083679
        3709
------------
   243753111
 189585753
 81251037
------------
100453365411
```

```
       (12)
    25058612
        6289
------------
   225527508
  200468896
  50117224
150351672
------------
157593610868
```

```
   (13)
   3523725
      2538
----------
  28189800
 10571175
17618625
7047450
----------
8943214050
```

```
    (14)
    2778588
       9867
-----------
   19450116
  16671528
 22228704
25007292
-----------
27416327796
```

```
       (15)
    79068025
        1386
------------
   494408150
  632544200
 237204075
 79068025
------------
109588282650
```

```
       (16)
      79094451
        764095
--------------
     395472255
    711850059
  316377804
 474566706
553661157
--------------
60435674536845
```

```
      (17)
     5076812
       97613
------------
    15230436
    5076812
  30460872
 35537684
45691308
------------
495562849756
```

(18)

$$\begin{array}{r}
9507340 \\
7071 \\
\hline
950734 \\
6655138 \\
6655138 \\
\hline
67226401140
\end{array}$$

(19)

$$\begin{array}{r}
12481630 \\
1509 \\
\hline
11233467 \\
6240815 \\
1248163 \\
\hline
18834779670
\end{array}$$

Ex. XVII. (p. 38.)

(13)

$$\begin{array}{r}
12)\underline{800709} \\
66725\tfrac{9}{12}
\end{array}$$

$$\begin{array}{r}
11)\underline{218581} \\
19871
\end{array}$$

(14)

Divisor = dividend − rem'r ÷ quotient.

∴ divisor = 84 − 3 ÷ 9 = 9.

Dividend = divisor × quotient + rem'r.

∴ dividend = 11 × 146 + 7 = 1613.

(15)

Cost of fowls 11 × 36 = 396 cts.

Selling price 396 cts. + 198 cts. = 594 cts.

Selling price per fowl 594 ÷ 11 = 54 cts.

(16)

$$\begin{array}{r}
9)\underline{214} \\
23\text{—}7 \text{ rem'r.}
\end{array}$$

(17)

Greater No. = 4563 − 9 = 4554.

∴ quotient = 4554 ÷ 9 = 506.

(18)

$$\begin{array}{r}
40687 \\
503 \\
\hline
122061 \\
203435 \\
\hline
20465561
\end{array}$$

$$\begin{array}{r}
11)\underline{93710562} \\
8519142
\end{array}$$

∴ diff. = 20165561 − 8519142 = 11946119.

(19)

$\$5427 - \$1500 = \$3927$.
Suppose cook's share $= 1$.
Then man-servant's sh. $= 2$.
Housekeeper's share $= 4$.
$\therefore$ total shares, 7.
$\$3927 \div 7 = \$561$.
$\$561 \times 1 =$ cook's share.
$\$561 \times 2 = \$1122$, man-servant's share.
$\$561 \times 4 = \$2244$, housekeeper's share.

(20)

Sum of 18 and $30 = 48$.
Diff. bet. 18 and $30 = 12$.
$48 \div 12 = 4$.
Product of 16 and $27 = 432$. $432 \times 4 = 1728$.

(21)

```
      907057
     6000006
     -------
     5442342
5442342
-------------
5442347442342
```

```
9)5442347442342
  -------------
   604705271371—3

   9 − 3 = 6.
```

(22)

$282 - 230 = 52$.
$\therefore$ No. of oranges $= 52 \div 2 = 26$.

(23)

Cost of penholders $4 \times 12 \times 10 = 480$ cts.
No. of envelopes $25 \times 20 = 500$.
500 @ 16 cts. per hundred $= 16 \times 5 = 80$ cts.
$480 + 80 = 560$ cts.
$\therefore$ No. of penknives $= 560 \div 16 = 35$.

Ex. XVIII. (p. 41.)

(7)

```
256)88832(347      308)175252(569      104)321776(3094
    768                1540                312
    ----               ----                ---
    1203               2125                 977
    1024               1848                 936
    ----               ----                ---
     1792               2772                416
     1792               2772                416
```

(8)

```
329) 653723 (1987
     329
     ----
     3247
     2961
     ----
      2862
      2632
      ----
       2303
       2303
```

```
506) 3577926 (7071
     3542
     ----
      3592
      3542
      ----
         506
         506
```

```
834) 542100 (650
     5004
     ----
      4170
      4170
```

(9)

```
909) 8189181 (9009
     8181
     ----
        8181
        8181
```

```
745) 4049820 (5436
     3725
     ----
     3248
     2980
     ----
      2682
      2235
      ----
       4470
       4470
```

```
883) 342604 (388
     2649
     ----
      7770
      7064
      ----
       7064
       7064
```

(10)

```
365) 7848600 (21503
     730
     ---
      548
      365
      ----
      1836
      1825
      ----
        1100
        1095
        ----
           5
```

```
678) 2339100 (3450
     2034
     ----
      3051
      2712
      ----
       3390
       3390
```

```
727) 90625 (124
     727
     ----
     1792
     1454
     ----
      3385
      2908
      ----
       477
```

(11)

```
478)27291888(57096
    2390
    ----
     3391
     3346
     ----
       4588
       4302
       ----
        2868
        2868
```

```
397)30387310(76542
    2779
    ----
     2597
     2382
     ----
      2153
      1985
      ----
       1681
       1588
       ----
         930
         794
         ---
         136
```

```
703)3273068(4655
    2812
    ----
     4610
     4218
     ----
      3926
      3515
      ----
       4118
       3515
       ----
        603
```

(12)

```
843)87624792(103944
    843
    ----
     3324
     2529
     ----
      7957
      7587
      ----
       3709
       3372
       ----
        3372
        3372
```

```
609)53006751(87039
    4872
    ----
     4286
     4263
     ----
       2375
       1827
       ----
        5481
        5481
```

```
513)90273189(175971
    513
    ---
    3897
    3591
    ----
     3063
     2565
     ----
      4981
      4617
      ----
       3648
       3591
       ----
         579
         513
         ---
          66
```

(Continued on next page)

(12 continued.)

609) 53006751 (87039
4872
4286
4263
2375
1827
5481
5481

358) 30073074 (84003
2864
1433
1432
1074
1074

652) 6307625409 81 (967427210
5868
4396
3912
4842
4564
2785
2608
1774
1304
4700
4564
1369
1304
658
652
61

(13)

2731) 519387042 (190182
2731
24628
24579
4970
2731
22394
21848
5462
5462

2185) 10101255 (4623
8740
13612
13110
5025
4370
6555
6555

3076) 154725876 (50301
15380
9258
9228
3076
3076

7243) 632798014 (87366
57944
53358
50701
26570
21729
48411
43458
49534
43458
6076

(14)

1004) 2015029 (2007
2008
7029
7028
1

6487) 131686100 (20300
12974
19461
19461

(Continued on next page.)

(14 continued.)

```
6007) 395494875 (65839
      36042
      -----
       35074
       30035
       -----
        50398
        48056
        -----
         23427
         18021
         -----
          54065
          54063
          -----
              2
```

```
1617) 50696184 (31352
      4851
      ----
       2186
       1617
       ----
        5691
        4851
        ----
         8408
         8085
         ----
          3234
          3234
```

(15)

```
5008) 4519559744 (902468
      45072
      -----
       12359
       10016
       -----
        23437
        20032
        -----
         34054
         30048
         -----
          40064
          40064
```

```
9306) 16322853 (1754
      9306
      ----
      70168
      65142
      -----
       50265
       46530
       -----
        37353
        37224
        -----
          129
```

(Continued on next page.)

(15 continued.)

```
1579) 23617103000 (14957000
      1579
      -----
       7827
       6313
       -----
        15111
        14211
        -----
          9000
          7895
          -----
          11053
          11053
```

```
2735) 2106144185 (770071
      19145
      -----
       19164
       19145
       -----
          19418
          19145
          -----
            2735
            2735
```

(16)

```
3782) 142997420 (37810
      11346
      -----
       29537
       26471
       -----
        30634
        30256
        -----
          3782
          3782
```

```
6016) 19554707200 (3250450
      18048
      -----
       15067
       12032
       -----
        30350
        30080
        -----
          27072
          24064
          -----
           30080
           30080
```

(Continued on next page.)

(16 continued.)

38706) 2828882701578 (73086413
270942

119462
116118

334470
309648

248221
232236

159855
154824

50317
38706

116118
116118

(17)

$257 \times 553 = 142121.$
$142121 \div 79 = 1799.$

(18)

Cost of gloves, $9 \times 12 \times 110 = 11880$ cts.
$\therefore$ No. of pairs stockings $= 11880 \div 66 = 180.$

(19)

$30984051 \div 288 = 107583$; rem'r 147.
$\therefore$ No. to be added $= 288 - 147 = 141.$

(20)

$274 + 108 = 382.$
$274 - 108 = 166.$
$382 \times 166 = 63412.$
$63412 \div 176 = 360$; rem'r 52.

(21)

$$\left.\begin{array}{r} 75 \times \$4 = \$300 \\ 94 \times \$3 = \$282 \\ 106 \times \$2 = \$212 \end{array}\right\} = \$794.$$

He wishes to realize \$794 + \$147, or \$941.
\$941 ÷ 275 (whole No. of sheep) = $\$3\frac{116}{275}$.

(22) Gain, \$267
Buying price, \$1068 − \$267 = \$801
\$801 ÷ 267 = \$3.

(23) $103 + 29 + 267 = 399.$
$399 \div 19 = 21.$
$21 \times 57 = 1197.$
$1197 - 197 = 1000.$

(24)
1 lamb is worth 16 ÷ 8 = \$2.
1 sheep is worth 60 ÷ 15 = \$4.
840 lambs cost 840 × \$2 = \$1680.
∴ No. of sheep = \$1680 ÷ 4 = 420.

(25)
$87403 - 355 = 87048.$
$87048 \div 216 = 403.$

(26)
$154979552 \div 416 = 372547.$

(27)
$479632 - 20 = 479612.$
$479612 \div 28 = 17129.$

(28)
Cost of keeping 29 bullocks 3 months @ \$5 = \$435.
∴ \$1885 + \$435 = \$2320 = whole cost.
∴ \$2610 − \$2320 = \$290 = whole gain.
∴ \$290 ÷ 29 = \$10 = gain per bullock.

Ex. XIX. (p. 43.)

(4)

9067) 806753245 (88976 $\frac{7853}{9067}$
72536
81393
72536
88572
81603
69694
63469
62255
54402
7853

(5)

70602) 612709066 (8678 $\frac{24910}{70602}$
564816
478930
423612
553186
494214
589726
564816
24910

(6)

896) 60005836 (66970 $\frac{716}{896}$
5376

6245
5376

8698
8064

6343
6272

716

(7)

9986) 70867509 (7096 $\frac{6853}{9986}$
69902

96550
89874

66769
59916

6853

(8)

868) 8673456954 (9992461 $\frac{806}{868}$
7812

8614
7812

8025
7812

2136
1736

4009
3472

5375
5208

1674
868

806

(9)

93256) 200006783 (2144 $\frac{65919}{93256}$
186512

134947
93256

416918
373024

438943
373024

65919

14609
719

131481
14609
102263

10503871

(10)

8067) 10503871 (1302 $\frac{637}{8067}$
8067

24368
24201

16771
16134

637

Ex. XX. (p. 51.)

(1)

£	*s.*	*d.*
709	16	8

20

14196 *s.*
12

170360 *d.*
4

681440 *q.*

(2)

mls.	fur.	ft.	in.
17	1	2	6

8

137 fur.
40

5480 poles.
$5\frac{1}{2}$

27400
2740

30140 yds.
3

90422 ft.
12

1085070 in.

(3)

tons.	cwt.	qrs.	lbs.
8	2	3	5

20

162 cwt.
4

651 qrs.
25

3260
1302

16280 lbs.
16

97680
16280

260480 oz.
16

1562880
260480

4167680 drs.

(4)

ac.	r.	sq.p.	s.yd.
612	2	0	27½

4

2450 r.
40

98000 p.
30¼

2940027½
24500

2964527½ yds.
9

26680747½ ft.
144

106722988
106722988
26680747

3842027568
72

3842027640 in.

(5)

mls.	fur.	po.	yds.	ft.	in.	ls.
10	5	5	5	0	5	5

8

85 fur.
40

3405 p.
5½

17030
1702½

18732½ yds.
3

56197½
12

674375 ft.
12

8092505 in.

(6)

ac.	r.	per.	yds.
5	0	3	29

4

20 r.
40

803 p.
30¼

24119
200¾

24319¾ yds.
9

218877¾ ft.
144

875508
875508
218877

31518288
108

31518396

(7)

17 days.
24

68
34

408 hrs.
60

24480 min.

(8)

lbs.	oz.	drs.	scr.	grs.
2	11	0	0	20

12
35 oz.
8
280 drs.
3
840 scr.
20
16820 grs.

(9)

lea.	mls.	fur.
2	2	7

3
8 mls.
8
71 fur.
40
2840 per.
5½
14200
1420
15620 yds.

(10)

cub.yds.	ft.	in.
23	0	1000

27
161
46
621 ft.
1728
5968
1242
4347
621
1074088 in.

(11)

galls.	qts.
13	3

4
55 qts.
2
110 pts.
4
440 gills.

(12)

220 bush.
4
880 pks.
2
1760 galls.
4
7040 qts.

(13)

yrs.	dys.
3	315

365
15
18
9
1095
315
1410 dys.
24
5640
2820
33840 hrs.
60
2030400 min.

(14)

lbs.	oz.	dwt.
27	5	16

12
329 oz.
20
6596 dwt.
24
26384
13192
158304 grs.

(15)

lbs.	oz.	drs.	sc.
47	11	6	2

12
575 oz.
8
4606 drs.
3
13820 sc.
20
276400 gr.

(16)

£	*s.*	*d.*
200	17	8½

20
4017 *s.*
12
48212 *d.*
2
96425 ½ *d.*

(17)

ac.	r.	per.
219	2	16

4

878 ro.

40

35136 per.

30¼

1054080

8784

1062864 yds.

(18)

yds.	qrs.	nls.
218	2	3

4

874 qrs.

4

3499 nls.

(19)

£	*s.*	*d.*
2376	19	8½

20

47539 *s.*

12

570476 *d.*

4

2281906 *q.*

(20)

cwt.	qrs.	lbs.
216	2	17

4

866 qrs.

25

4347

1732

21667 lbs.

(21)

25° 36′

60

1536′

60

92160″

(22)
mls. fur. per. yds.
8 3 0 4
8
67 fur.
40
2680 per.
5½
13404
1340
14744 yds.
3
44232 ft.
12
530784 in.

(23)
£ *s.* *d.*
312 17 6½
20
6257 *s.*
12
75090 *d.*
4
300362 *q.*

(24)
lbs.
105
12
1260 oz.
20
25200 dwt.
24
100800
50400
604800 grs.

(25)
E. ells.
26
5
130 qrs.
4
520 nls.

(26)
Fr. ells.
37
6
222 qrs.
4
888 nls.

(27)
£ *s.* *d.*
576 0 6¼
20
11340 *s.*
12
136086 *d.*
4
544345 *q.*

(28)
lbs. oz.
287 6
12
3450 oz.
8
27600 drs.
3
82800 sc.

(29)
pipes.
3
2
6 hhds.
63
378 galls.

(30)
£ *s.* *d.*
200 19 6½
20
4019 *s.*
12
48234 *d.*
4
192938 *q.*

Ex. XXI. (p. 53.)

(1)
4) 123290
12) 30822 — ½ *d.*
2$\cancel{0}$) 256$\cancel{8}$ — *s.* 6 *d.*
£128 8 *s.* 6½ *d.*

(2)
24) 13172 Grains
20) 548 — 20 grs.
12) 27 — 8 dwt.
2 lbs. 3 oz. 8 dwt. 20 grs.

(3)
2) 18191
4) 9095 — 1 pt.
2273 galls. 3 qts. 1 pt.

(4)
12) 76787568
3) 6398964
5½) 2132988 — yds.
2 2
11) 4265976
40) 387816
8) 9695 — 16 poles.
3) 1211 — 7 fur.
403 lea. 2 mls. 7 fur. 16 poles.

(5)
16) 2007008
16) 125438
25) 7839 — 14 oz.
4) 313 — 14 lbs.
20) 78 — 1 qr.
3 tons. 18 cwt. 1 qr. 14 lbs. 14 oz.

(6)
4$\cancel{0}$) 9382$\cancel{7}$
4) 2345 r. — 27 per.
586 a. 1 r. 27 per.

(7)

24) 167812 Grs-

20) 6992 — 4 grs.

12) 349 — 12 dwt.

29 lbs. 1 oz. 12 dwt. 4 grs.

(8)

12) 8756765637

12) 729730469 — 9 lines.

3) 60810872 — 5 inches.

5½) 20270290 — 2 ft.
2 2

11) 40540580

40) 3685507 — 1½ yds.

8) 92137 — 27 poles.

11517 mls. 1 fur. 27 p. 2 yds. 0 ft. 11in. 9 ls.

(9)

16) 7678678956

16) 479917434 — 12 drs.

25) 29994839 — 10 oz.

4) 1199793 — 14 lbs.

20) 299948 — 1 qr.

14997 ts. 8 cwt. 1 qr. 14 lbs. 10 oz. 12 drs.

(10)
12) 121605 miles
3) 10133 ft. – 9 in.
5½) 3377 – 2 ft.
2 2
11) 6754
40) 614
8) 15 – 14 po.
1 ml. 7 fur. 14 p. 0 yds. 2 ft. 9 in.

(11)
24) 98006 grs
20) 4083 – 14 grs.
12) 204 – 3 dwt.
17 lbs. 0 oz. 3 dwt. 14 grs.

(12)
16) 2022752 dr.
16) 126422
25) 7901 – 6 oz.
4) 316 – 1 lb.
20) 79 – 0 qrs.
3 tons. 19 cwt. 0 qrs. 1 lb. 6 oz.

(13)
20) 702917
3) 35145 – 17 grs.
8) 11715 – 0 sc.
12) 1464 – 3 dr.
122 lb. 0 oz. 3 dr. 0 sc. 17 gr.

(14)
60) 1727893 sec
60) 28798 – 13 sec.
24) 479 – 58 min.
7) 19 – 23 hrs.
2 wk. 5 dy. 23 hr. 58′13″

(15)
30¼) 172425
4 4
121) 689700
40) 5700 sq. poles.
4) 142 r. – 20 sq. poles.
35 a. 2 r. 20 sq.po.

(16)
1728)13856832
27)8019 cub. ft.
297 cub.yds.

(17)
144)1244160000
9)8640000 sq. ft.
30¼)960000
4 4
121)3840000
40)31735—16¼ sq. yds.
4)793 r.—15 sq. per.
198 a. 1 r. 15 s.p. 16¼ s.yds

(18)
4)500
4)125
31 yds. 1 qr.

(19)
$6\cancel{0}$)$13107\cancel{5}$
$6\cancel{0}$)$218\cancel{4}$ min.—35 sec.
36 hrs. 24 min. 35 sec.

(20) sec
$6\cancel{0}$)$3155760\cancel{0}$
$6\cancel{0}$)$52596\cancel{0}$ min.
24)8766 hrs.
365 dys. 6 hrs.

(21) pts
2)219612
4)109806 qts.
54)27451 galls. 2 qts.
508 hhds. 19 gals. 2 qts.

(22) pts
2)300738
4)150369 qts.
63)37592 galls. 1 qt.
596 hhds. 44 gals. 1 qt.

(23) lb
60)912715
15211 bu. 55 lbs.

(24) lbs
34)1000000
29411 bu. 26 lbs.

(25) lbs
60)7263
121 bu. 3 lbs.

(26)
$307.47

(27)
4) 973647
12) 243411 d.—3 q.
20) 20284 s.—3¾ d.
£1014 . 4 s. 3¾ d.

Ex. XXV. (p. 59.)

(15)

lbs.	oz.	dwt.	grs.
6	2	3	17 × 2
			10
61	9	17	2 × 8
			10
618	2	10	20 × 3
			10
6182	1	8	8
			5
30910	7	1	16
1854	7	12	12
494	6	16	16
12	4	7	10
33272	1	18	6

(16)

£	s.	d.
13	7	4¾
		11
147	1	4¼
		5
735	6	9¼
		5
3676	13	10¼

(17)

ac.	r.	per.	yds.	ft.	in.
20	2	17	15	3	3
					8
164	3	20	1	6	24
					8
1319	0	0	13	4	48

(18)

mls.	fur.	per.	yds.	ft.	in.
2	6	2	3	0	5
					5
13	6	12	4	2	1
					5
68	7	24	1	1	1
					5
344	6	1	1½	1	1
					3
1034	2	4	0	0	3

(19)

£	s.	d.
2	6	8¼
		10
23	6	10½
		10
233	8	9
		9
2100	18	9

(20)

$237.15
100

$23715.00
5

$118575.00

(21)

bu.	pk.	galls.
10	2	1
		10
106	1	0
		10
1062	2	0
		8
8500	0	0

Ex. XXVI. (p. 61.)

(1)

cwt.	qrs.	lbs.	oz.
3	3	21	5
			10
39	2	13	2
			8
317	0	5	0
35	2	16	13
352	2	21	13

(2)

lbs.	oz.	dwt.	grs.
6	2	3	17
			10
61	9	17	2
			10
618	2	10	20
			10
6182	1	8	8
			5
30910	7	1	16
2472	10	3	8
370	11	2	12
18	6	11	3
33772	10	18	15

(3)

£	s.	d.
2	6	9½
		10
23	7	11
		10
233	19	2
		9
2105	12	6
70	3	9
18	14	4
2194	10	7

(4)

cwt.	qrs.	lbs.	oz.	drs.
2	3	23	6	7
				10
29	3	9	0	6
				10
298	1	15	3	12
				6
1790	1	16	6	8
59	2	18	0	12
20	3	13	13	1
1870	3	23	4	5

(5)

£	s.	d.
4	18	9½
		10
49	7	11
		10
493	19	2
		5
2469	15	10
296	7	6
4	18	9½
2771	2	1½

(6)

lbs.	oz.	drs.	sc.	grs.
15	2	3	2	7
				10
152	0	5	2	10
				10
1520	7	2	1	0
				7
10644	3	0	1	0
152	0	5	2	10
30	4	7	1	14
10826	8	5	2	4

(7)

$2.25
209
2025
450
$470.25

(8)

$1.27
52
254
635
$66.04

(9)

1625 cts.
6
$97.50

(10)

qrs.	lbs.	oz.
1	17	8
		10
17	0	0
		2
34	0	0
15	7	8
cwt.12 . 1	7	8

(11)

100000
40
$40000.00

Ex. XXVII. (p. 63.)

(1)

	£	s.	d.
5)	278	15	8
	55	15	$1\frac{3}{5}$

(2)

	lbs.	oz.	dwt.	grs.
8)	237	5	6	0
	29	8	3	6

(3)

	mls.	fur.	per	yds.	ft.	in.
9)	217	5	16	2	0	0
	24	1	19	3	10	10

(4)

	yds.	qrs.	nls.
5)	115	2	2
	23	0	2

(5)

	lbs.	oz.	drs.	sc.	grs.
6)	865	9	0	2	10
	144	3	4	0	$8\frac{2}{6}=\frac{1}{3}$

(6)

	£	s.	d.
11)	2078	17	$11\frac{1}{4}$
	188	19	$9\frac{3}{4}$

(7)

	tons.	cwt.	qrs.	lbs.	oz.	drs.
9)	67	13	1	17	0	0
3)	7	10	1	13	0	0
	2	10	0	12	10	$10\frac{2}{3}$

(8)

	ac.	rds.	per.	yds.	ft.	in.
7)	976	2	19	25	0	0
8)	139	2	2	25	1	87 − 3 rem.
	17	1	30	10	6	55 − 7 rem.

$7 \times 7 + 3 = 52$, true rem.

$\frac{52}{56} = \frac{13}{14}$.

(9)

```
     cwt.  qrs.  lbs.  oz.  drs
705) 612    0     17    0    2 (3 qrs.
       4
    ----
    2448
    2115
    ----
     333
      25
    ----
    1682
    666
    ----
    8342 (11 lbs.
    705
    ----
    1292
     705
    ----
     587
      16
    ----
    3522
    587
    ----
    9392 (13 oz.
    705
    ----
    2342
    2115
    ----
     227
      16
    ----
    1364
    227
    ----
    3634 (5 109/705 drs.
    3525
    ----
     109
```

Ans.—3 qrs. 11 lbs. 13 oz. $5\frac{109}{705}$ drs.

(10)

```
      mls.  fur.  yds.
1247) 8627   6     2 (7 fur.
      7482
      ----
      1145
         8
      ----
      9166
      8729
      ----
       437
        40
      -----
      17480 (14 per.
      1247
      -----
       5010
       4988
       ----
         22
          5½
        ---
        112
         11
        ---
        123 (0 yds.
          3
        ---
        369 (0 ft.
         12
       ----
       4428 (3 687/1247 in.
       3741
       ----
        687
```

Ans.—7 fur. 14 per. $3\frac{687}{1247}$ in.

(11)

	bu.	pks.	gall.	qts.	pts.
12)	612	2	1	2	0
8)	51	0	0	1	1 rem.—8
	6	1	1	0	0 rem.—3

$3 \times 12 + 8 = 44$, true rem.

(12)

	£	s.	d.
9)	2851	16	$4\frac{1}{2}$
6)	316	17	$4\frac{1}{2}$
	52	16	$2\frac{3}{4}$

(13)

	lbs.	oz.	drs.	sc.	grs.
57)	247	10	7	1	0 (4 lbs.

228

19

12

238 (4 oz.

228

10

8

87 (1 dr.

57

30

3

91 (1 sc.

57

34

20

680 ($11\frac{53}{57}$ grs.

627

53

Ans.—4 lbs. 4 oz. 1 dr. 1 sc. $11\frac{53}{57}$ grs.

(14)

mls. fur. per.
211) 200 . 3 . 6 (7 fur.
8
1603
1477
126
40
5046 (23 per.
422
826
633
193
$5\frac{1}{2}$
965
$96\frac{1}{2}$
$1061\frac{1}{2}$ (5 yds.
1055
$6\frac{1}{2}$
3
$19\frac{1}{2}$
12
234 (1 in.
211
23
12
276 (1 $\frac{65}{211}$ ls
211
65

ANS.—7 fur. 23 per. 5 yds. 1 in. 1 $\frac{65}{211}$ ls.

(15)

ac. r. per. yds.
318) 416 3 19 7 (1 ac.
318

98
4

395 (1 ro.
318

77
40

3099 (9 per.
2862

237
$30\frac{1}{4}$

7117
$59\frac{1}{4}$

$7176\frac{1}{4}$ (22 yds.
636

$816\frac{1}{4}$
636

$180\frac{1}{4}$
9

$1622\frac{1}{4}$ (5 ft.
1590

$32\frac{1}{4}$
144

128
128
32

4608
36

4644 ($14\frac{192}{318}$ in.
318

1464
1272

192

318

Ans.—1 ac. 1 ro. 9 per. 22 yds. 5 ft. $14\frac{192}{318}$ in.

(16)

tons. cwt. qrs.
564) 614 2 3 (1 ton.
564

50
20

1002 (1 cwt.
564

438
4

1755 (3 qrs.
1692

63
25

315
126

1575 (2 lbs.
1128

447
16

2682
447

7152 (12 oz.
564

1512
1128

384
16

2304

2304
384

6144 ($10\frac{504}{564}$ drs.
5640

504

(17)
c. yds. c. ft. c. in.
169) 917 9 100 (5 c. yds.
845
72
27
513
144
1953 (11 c. ft.
169
263
169
94
1728
852
188
658
94
162532 (961$\frac{123}{169}$ c. in.
1521
1043
1014
292
169
123

(18)
lbs. oz. drs. sc.
212) 926 5 3 2 (4 lbs.
848
78
12
941 (4 oz.
848
93
8
747 (3 drs.
636
111
3
335 (1 sc.
212
123
20
2460 (11$\frac{128}{212}$ grs.
212
340
212
128

(19)

lbs. dwt.

634) 3068 8 (4 lbs.

2536

532

12

6384 (10 oz.

6340

44

20

888 (1 dwt.

634

254

24

1016

508

6096 ($9\frac{390}{634}$ grs.

5706

390

ANS.—4 lbs. 10 oz. 1 dwt. $9\frac{390}{634}$ grs.

(20)

£ s. d.

758) 1914 10 5 (£2

1516

398

20

7970 (10s.

7580

390

12

4685 ($6\frac{137}{758}$d.

4548

137

ANS.—£2 10s. $6\frac{137}{758}$d.

(21)

£ s. d.

317) 215 12 $6\frac{1}{4}$ (13s. $7\frac{1}{4}$d.

20

4312

317

1142

951

191

12

2298 (7d.

2219

79

4

317 ($\frac{1}{4}$ q.

317

ANS.—13s. $7\frac{1}{4}$d.

(22)

yrs. dys. hrs. min.
397) 125 127 16 47 (115 days.
365
752
750
375
45752
397
605
397
2082
1985
97
24
404
194
2344 (5 hrs.
1985
359
60
21587 (54 min.
1985
1737
1588
149
60
8940 (22$\frac{206}{397}$ sc.
794

1000
794
206

Ans.—115 dys. 5 hrs. 54′. 22$\frac{206}{397}$″.

(23)

267) \$2267.84 (\$8.49$\frac{101}{267}$.
2136
1318
1068
2504
2403
101

(24)

425) \$5693.75 (\$13.39$\frac{300}{425}$.
425
1443
1275
1687
1275
4125
3825
300

(25)

365) \$600.00 (\$1.64$\frac{140}{365}$.
365
2350
2190
1600
1460
140    $365 - 52 = 313$.

313) \$600.00 (\$1.91$\frac{217}{313}$.
313
2870
2817
530
313
217

(26)

57) \$265.05 (\$4.65
228
370
342
285
285

(27)

57) \$65.55 (\$1.15
57
85
57
285
285

(28)

52) \$132.00 (\$2.53$\frac{44}{52}$
104
280
260
200
156
44

Ex. XXVIII. (p. 64.)

(1)

£684 7s. 6d. = 164250d.
£76 0s. 10d. = 18250d.
164550 ÷ 18250 = 9 times.

(2)

£171 1s. 10$\frac{1}{2}$d. = 82125$\frac{1}{2}$d.
£57 0s. 7$\frac{1}{2}$d. = 27375$\frac{1}{2}$d.
82125 ÷ 27375 = 3 times.

(3)

9 lbs. 9 oz. 3 dwt. 12 grs. = 56244 grs.
5 dwt. 9 grs. = 129 grs.
56244 ÷ 129 = 436 times.

(4)

4 mls. 1 fur. 2 yds. = 21786 ft.
1 ml. 3 fur. 2 ft. = 9262 ft.
21786 ÷ 9262 = 3 times.

(5)

6 cwt. 2 qrs. = 10400 oz.
1 qr. 3 oz. = 403 oz.
10400 ÷ 403 = $25\frac{325}{403}$ times.

(6)

12 lbs. 6 oz. 2 sc. = 72040 gr.
1 lb. 6 oz. 2 sc. 10 grs. = 8690 grs.
72040 ÷ 8690 = $8\frac{252}{869}$ times.

(7)

3 yds. 1 qr. 2 nls. = 54 nls.
1 qr. 2 nls. = 6 nls.
54 ÷ 6 = 9 times.

(8)

1 dy. 1 hr. 12 min. = 1512 min.
1 hr. 3 min. = 63 min.
1512 ÷ 63 = 24 times.

(9)

5s. per. 7 yds. 108 in. = 205200 in.
2 yds. 1 ft. = 2736 in.
205200 ÷ 2736 = 75 times.

(10)

$141.05 = 14105 cts.
$ 2.17 = 217 cts.
14105 ÷ 217 = 65 times.

(11)

$221.00 = 22100 cts.
$ 2.21 = 221 cts.
22100 ÷ 221 = 100 times.

Ex. XXIX. (p. 65.)

(1)

£25 × 4 = $100.00
6s. × 20 = 1.20
3d. = 12 q. × 5 ÷ 12 = .05

$101.25

(2)

£57 × 4 = $228.00
19s. × 20 = 3.80
3d. = 12 q. × 5 ÷ 12 = .05

$231.85

(3)

£207 × 4 = $828.00
17s. × 20 = 3.40
8d. = 32 q. × 5 ÷ 12 = $.13\frac{1}{3}$

$\$831.53\frac{1}{3}$

(4)

$$\begin{array}{rr}
\pounds153 \times 4 = & \$612.00\\
18\text{s.} \times 20 = & 3.60\\
5\text{d.} = 20\text{ q.} \times 5 \div 12 = & .08\tfrac{1}{3}\\
\hline
 & \$615.68\tfrac{1}{3}
\end{array}$$

(5)

$$\begin{array}{rr}
\pounds217 \times 4 = & \$868.00\\
17\text{s.} \times 20 = & 3.40\\
\hline
 & \$871.40
\end{array}$$

(6)

$$\begin{array}{rr}
\pounds319 \times 4 = & \$1276.00\\
15\text{s.} \times 20 = & 3.00\\
7\tfrac{1}{2}\text{d.} = 30\text{ q.} \times 5 \div 12 = & .12\tfrac{1}{2}\\
\hline
 & \$1279.12\tfrac{1}{2}
\end{array}$$

(7)

$$\begin{array}{rr}
\pounds612 \times 4 = & \$2448.00\\
19\text{s.} \times 20 = & 3.80\\
11\tfrac{1}{4}\text{d.} = 45\text{ q.} \times 5 \div 12 = & .18\tfrac{3}{4}\\
\hline
 & \$2451.98\tfrac{3}{4}
\end{array}$$

(8)

$$\begin{array}{rr}
\pounds63 \times 4 = & \$252.00\\
9\text{s} \times 20 = & 1.80\\
9\tfrac{3}{4}\text{d.} = 39\text{ q.} \times 5 \div 12 = & .16\tfrac{1}{4}\\
\hline
 & \$253.96\tfrac{1}{4}
\end{array}$$

(9)

$$\begin{array}{rr}
\pounds912 \times 4 = & \$3648.00\\
12\text{s.} \times 20 = & 2.40\\
6\text{d.} = 24\text{ q.} \times 5 \div 12 = & .10\\
\hline
 & \$3650.50
\end{array}$$

(10)

$$\begin{array}{rr}
\pounds711 \times 4 = & \$2844.00\\
5\text{s.} \times 20 = & 1.00\\
5\tfrac{1}{2}\text{d.} = 22\text{ q.} \times 5 \div 12 = & .09\tfrac{1}{6}\\
\hline
 & \$2845.09\tfrac{1}{6}
\end{array}$$

(11)

$$\begin{array}{rr}
\pounds1117 \times 4 = & \$4468.00\\
7\tfrac{1}{2}\text{d.} = 30\text{ q.} \times 5 \div 12 = & .12\tfrac{1}{2}\\
\hline
 & \$4468.12\tfrac{1}{2}
\end{array}$$

(12)

$$\begin{aligned} \pounds 47 \times 4 &= \$188.00 \\ 7\text{ s.} \times 20 &= 1.40 \\ 9\text{ d.} = 36\text{ q.} \times 5 \div 12 &= .15 \\ &\quad \$189.55 \end{aligned}$$

(13)

$$\begin{aligned} \pounds 2017 \times 4 &= \$8068.00 \\ 6\text{ s.} \times 20 &= 1.20 \\ 8\text{ d.} = 32\text{ q.} \times 5 \div 12 &= .13\tfrac{1}{3} \\ &\quad \$8069.33\tfrac{1}{3} \end{aligned}$$

(14)

$$\begin{aligned} \pounds 75 \times 4 &= \$300.00 \\ 9\text{s.} \times 20 &= 1.80 \\ 8\tfrac{1}{2}\text{d.} = 34\text{ q.} \times 5 \div 12 &= .14\tfrac{1}{6} \\ &\quad \$301.94\tfrac{1}{6} \end{aligned}$$

(15)

$$\begin{aligned} \pounds 37 \times 4 &= \$148.00 \\ 18\text{s.} \times 20 &= 3.60 \\ 7\tfrac{1}{2}\text{d.} = 30\text{ q.} \times 5 \div 12 &= .12\tfrac{1}{2} \\ &\quad \$151.72\tfrac{1}{2} \end{aligned}$$

(16)

$$\begin{aligned} \pounds 87 \times 4 &= \$348.00 \\ 13\text{s.} \times 20 &= 2.60 \\ 9\text{d.} = 36\text{ q.} \times 5 \div 12 &= .15 \\ &\quad \$350.75 \end{aligned}$$

Ex. XXX. (p. 66.)

(1)

$\$217 \div 4 = \pounds 54 + \$1$
$125\text{ cts.} \div 20 = 6\text{ s.} + 5\text{ cts.}$
$5\text{ cts.} \times 3 \div 5 = 3\text{d.}$
£54 6s. 3d.

(2)

$\$327 \div 4 = \pounds 81 + \$3$
$355\text{ cts.} \div 20 = 17\text{s.} + 15\text{c.}$
$15\text{ cts.} \times 3 \div 5 = 9\text{d.}$
£81 17s. 9d.

(3)

$\$17 \div 4 = \pounds 4 + \$1$
$135\text{ cts.} \div 20 = 6\text{s.} + 15\text{c.}$
$15\text{ cts.} \times 3 \div 5 = 9\text{d.}$
£4 6s. 9d.

(4)

$\$84 \div 4 = \pounds 21.$
$50\text{ cts.} \div 20 = 2\text{s.} + 10\text{ cts.}$
$10\text{ cts.} \times 3 \div 5 = 6\text{d.}$
£21 2s. 6d.

(5)

$\$75 \div 4 = £18 + \$3$

$395\text{c.} \div 20 = 19\text{s.} + 15\text{c.}$

$15\text{c.} \times 3 \div 5 = 9\text{d.}$

£18 19s. 9d.

(6)

$\$125 \div 4 = £31 + \$1$

$137\frac{1}{2}\text{c.} \div 20 = 6\text{s.} + 17\frac{1}{2}\text{c.}$

$17\frac{1}{2}\text{c.} \times 3 \div 5 = 10\frac{1}{2}\text{d.}$

£31 6s. $10\frac{1}{2}$d.

(7)

$\$867 \div 4 = £216 + \$3$

$387\frac{1}{2}\text{c.} \div 20 = 19\text{s.} + 7\frac{1}{2}\text{c.}$

$7\frac{1}{2}\text{c.} \times 3 \div 5 = 4\frac{1}{2}\text{d.}$

£216 19s. $4\frac{1}{2}$d.

(8)

$\$1162 \div 4 = £290 + \$2$

$240\text{c.} \div 20 = 12\text{s.}$

£290 12s.

(9)

$\$1393 \div 4 = £348 + \$1$

$162\frac{1}{2}\text{c.} \div 20 = 8\text{s.} + 2\frac{1}{2}\text{c.}$

$2\frac{1}{2}\text{c.} \times 3 \div 5 = 1\frac{1}{2}\text{d.}$

£348 8s. $1\frac{1}{2}$d.

(10)

$\$1937 \div 4 = £484 + \$1$

$120\text{c.} \div 20 = 6\text{s.}$

£484 6s.

(11)

$\$2220 \div 4 = £555$

$29\text{c.} \div 20 = 1\text{s.} + 9\text{c.}$

$9\text{c.} \times 3 \div 5 = 5\frac{2}{5}\text{d.}$

£555 1s. $5\frac{2}{5}$d.

(12)

$\$3785 \div 4 = £946 + \$1$

$148\text{c.} \div 20 = 7\text{s.} + 8\text{c.}$

$8\text{c.} \times 3 \div 5 = 5\frac{4}{5}\text{d.}$

£946 7s. $5\frac{4}{5}$d.

EX. XXXI. (p. 66.)

PAPER I.

(1)	(2)	(3)
35700	55146	100000
24191	23503	229713
18777	9889	58705
18129	6275	612517
21187	8369	999999
	4584	833719
117984		768309
	107766	50050
		3653012

(4)

5005
7018
17915
28719
9012
807512
717017
93502
212607

1898307

(5)

12) 178006

3) 14833—10 in.

$5\frac{1}{2}$ { 4944—1 ft.
2

11) 9888 }

$4\cancel{0}$) $89\cancel{8}$—10 hf. yds. = 5 yds.

8) 22—18 per.

2—6 fur.

Ans.—2 mls., 6 fur., 18 per., 5 yds., 1 ft., 10 in.

(6)

\$ 8375180.20 ÷ 1493332 = \$ 5.60 and a fraction.
\$43054836.00 ÷ 2506755 = \$17.17 " "
\$17.17 − \$5.60 = \$11.57

PAPER II.

(1

8s. $10\frac{1}{2}$d. × 818
10

£4 8s. 9d.
10

£44 7s. 6d.
8

£355 0s. 0d.
4 8s. 9d.
3 11s. 0d.

£362 19s. 9d.

(2)

67 × \$1.62 = \$108.54
82c. × $13\frac{1}{2}$ = \$ 11.07
\$11.07 + \$18 + \$16 = \$ 45.07 =
Total amount expended,
\$108.54 − \$45.07 = \$63.47

(3)

	ac.	ac.	r.	per.	yds.	ft.
397)	72812	(183	1	24	26	$7\frac{155}{397}$

$$\begin{array}{rl}
397 & \\
\hline
3311 & \\
3176 & \\
\hline
1352 & \\
1191 & \\
\hline
161 & \\
4 & \\
\hline
644 & (1 \text{ ro.}\\
397 & \\
\hline
247 & \\
40 & \\
\hline
9880 & (24 \text{ p.}\\
794 & \\
\hline
1940 & \\
1588 & \\
\hline
352 & \\
30\frac{1}{4} & \\
\hline
10648 & (26 \text{ yds.}\\
794 & \\
\hline
2708 & \\
2382 & \\
\hline
326 & \\
9 & \\
\hline
2934 & (7\frac{155}{397} \text{ ft.}\\
2779 & \\
\hline
155 &
\end{array}$$

(4)

160 × \$1.60 = \$256.00

\$256 ÷ 27 = \$ $9.48\frac{4}{27}$

(5)

$42\frac{1}{2}$ yds. ÷ $8\frac{1}{2}$ = 5

$8\frac{1}{2}$ × 6s. $6\frac{1}{2}$d. = £2 15s. $7\frac{1}{4}$d.

(6)

Amt. rec'd = £1 13s. 9d. × 618

= £1042 17s. 6d. = \$4171.50

84 × 17c. = \$ 14.28

3s. 9d. × 5 = 18s. 9d. = 3.75

£1 15s. × 2 = £3 10s. = 14.00

£2 11s. 9d. × 8 = £20 14s. = 82.80

£12 19s. 9d. × 15 = £194 18s. 9d. = 779.25

∴ Total amount expended = \$944.08

∴ Deposit in bank = \$4171.50 − \$944.08 = \$3227.42.

PAPER III.

(1)

```
         £        s.  d.
203761) 9520732  14  6 (£46
        815044
        -------
        1370292
        1222566
        -------
         147726
             20
        -------
        2954534 (14s.
        203761
        -------
         916924
         815044
        -------
         101880
             12
        -------
        1222566 (6d.
        1222566
        -------
```

(2)

Suppose 1 to represent the 1st man's share,

$\therefore 1 + 3 + 5 = 9 =$ No. of shares.

$\$63000 \div 9 = \$7000 =$ value of a share.

$$\$7000 \times 1 = \$\ 7000$$
$$\$7000 \times 3 = \$21000$$
$$\$7000 \times 5 = \$35000$$

(3)

```
     £   s.  d.
26) 354  11  6 (£13
    26
    ---
     94
     78
    ---
     16
     20
    ---
    331 (12s.
    312
    ---
     19
     12
    ---
    234 (9d.
    234
    ---
```

(4)

ac. ro. per. yds.
29) 10 2 7 2 (1 ro. 18 per. 5 yds. 2 ft.
4
42
29
13
40
527 (18 per.
29
237
232
5
$30\frac{1}{4}$
152
$1\frac{1}{4}$
$153\frac{1}{4}$ (5 yds.
145
$8\frac{1}{4}$
9
$74\frac{1}{4}$ (2 ft.
58
$16\frac{1}{4}$

(5)

tons. cwt. qrs.
347) 300 15 3 (17 cwt.
20
6015
347
2545
2429
116
4
467 (1 qr.
347
120
25
600
240
3000 (8 lbs.
2776
224
16
1344
224
3584 (10 oz.
347
114
16
684
114
1824 (5 drs.
1735
89

(6)

20 mls. = 267200 in.
2 ft. 6 in. = 30 in.
∴ No. of steps taken =
267200 ÷ 30 = 42240
No. of minutes occupied in walking =
42240 ÷ 110 = 384
$\frac{1}{2}$ hr. = 30 minutes' rest.
∴ 384 + 30 = 414 min. =
6 hrs. 54 min.

PAPER IV.

(1)

£6 17s. 6d. = \$27.50
£3 12s. 9d. = \$14.55
∴ sum = \$27.50 +
\$30.27 + \$14.55 + \$75.83
= \$148.15.

(6)

84889 − 889 = 84000
84000 ÷ 2 = 42000
42000 + 889 = 42889

(2)

8 + 3 = 11
8 + 11 − 1 = 18

(3)

54 ÷ 6 = 9
9 × 1 = 9
9 × 2 = 18
9 × 3 = 27

(4)

4 × 38 = 152 doz.
Owner net, 1 sh.
Owner boat, 2 shs.
Each man, 4 shs.
Four men, 16 shs.
∴ total no. of shs.
= 1 + 2 + 16 = 19
152 ÷ 19 = 8 doz. =
value of 1 share.
8 × 1 = 8 dozs.
8 × 2 = 16 "
8 × 4 = 32 "

PAPER V.

(1)

$$\begin{array}{r}
72678397 \\
86073 \\
\hline
218035191 \\
508748779 \\
436070382 \\
581427176 \\
\hline
6255647664981
\end{array}$$

(2)

73697 × 11689 = 861444233
861444233 + 3687 = 861447920

(3)

27812 − 15908 = 11904

(4)

89264 ÷ 7 = 12752

(5)

$$\begin{array}{r}
22983 \\
96801 \\
64183 \\
91308 \\
190060 \\
\hline
465335
\end{array}$$

(6)

$$\begin{array}{r}
10240 \\
704 \\
8084 \\
4312 \\
72247 \\
\hline
95587
\end{array}$$

PAPER VI.

(1)

160302 + 168795 = 329097
71973 + 24527 = 96500

$$\begin{array}{r}
160302 \\
329097 \\
71973 \\
96500 \\
\hline
657872
\end{array}$$

(2)

$$\begin{array}{r}
\$6000000 \\
4866666 \\
1467750 \\
800000 \\
1909640 \\
590382 \\
862033 \\
\hline
\$16496471
\end{array}$$

(3)

$7328146.68
1888576.76
621936.42
417474.00
66554.00
122142.77

$10444830.63

(4)

$375, team,
$ 82, wagon,
$ 16, plough,
$ 16, stove,
$153, reaping machine,
$ 96, sheep,
$ 50, cows,
$ 18, pigs,
$ 60, wages.

Total expenditure = $866,
$975 − $866 = $109
$109 ÷ $1.75 = 62.28$\frac{4}{7}$
no. of hundred lbs.
62.28$\frac{4}{7}$ × 100 = 6228$\frac{4}{7}$ lbs.

(5)

ac.
635) 86895 (136 ac.
635
2339
1905
4345
3810
535
4
2140 (3 ro.
1905
235
40
9400 (14 per.
635
3050
2540
510
30$\frac{1}{4}$
15300
127$\frac{1}{2}$

15427$\frac{1}{2}$ (24$\frac{375}{1270}$ yds.
1270
2727$\frac{1}{2}$
2540

$\frac{187\frac{1}{2}}{635} = \frac{375}{1270}$

(6)

mls.	per.	yds.
10	3	4

8
80
40
3203
5$\frac{1}{2}$
16019
1601$\frac{1}{2}$
17620$\frac{1}{2}$
3
52861$\frac{1}{2}$
12
634338

Ex. XXXII. (p. 71.)

(1)
8) 18 (2
16
—
2) 8 (4
8
—
∴ G. C. M. is 2

(2)
6) 15 (2
12
—
3) 6 (2
6
—
∴ G. C. M. is 3

(3)
4) 22 (5
20
—
2) 4 (2
4
—
∴ G. C. M. is 2

(4)
16) 28 (1
16
—
12) 16 (1
12
—
4) 12 (3
12
—
∴ G. C. M. is 4

(5)
20) 32 (1
20
—
12) 20 (1
12
—
8) 12 (1
8
—
4) 8 (2
8
—
∴ G. C. M. is 4

(6)
24) 39 (1
24
—
15) 24 (1
15
—
9) 24 (2
18
—
6) 9 (1
6
—
3) 6 (2
6
—
∴ G. C. M. is 3

(7)
26) 44 (1
26
—
18) 26 (1
18
—
8) 18 (2
16
—
2) 8 (4
8
—
∴ G. C. M. is 2

(8)
30) 42 (1
30
—
12) 30 (2
24
—
6) 12 (2
12
—
∴ G. C. M. is 6

(9)
36) 56 (1
36
—
20) 36 (1
20
—
16) 20 (1
16
—
4) 16 (4
16
—
∴ G. C. M. is 4

(10)
46) 116 (2
92
—
24) 46 (1
24
—
22) 24 (1
22
—
2) 22 (11
22
—
∴ G. C. M. is 2

(11)
58) 174 (3
174
—
∴ G. C. M. is 3

(12)
315) 378 (1
315
63) 315 (5
315
∴ G. C. M. is 63

(13)
128) 366 (2
256
110) 128 (1
110
18) 110 (6
108
2) 18 (9
18
∴ G. C. M. is 2

(14)
180) 210 (1
180
30) 180 (6
180
∴ G. C. M. is 30

(15)
310) 630 (2
620
10) 310 (31
310
∴ G. C. M. is 10

(16)
424) 1216 (2
848
368) 424 (1
368
56) 368 (6
336
32) 56 (1
32
24) 32 (1
24
8) 24 (3
24
∴ G. C. M. is 8

(17)
127) 445 (4
381
64) 127 (1
64
63) 64 (1
63
1) 63 (63
63
∴ No G. C. M.

(18)
6408) 7264 (1
6408
856) 6408 (7
5992
416) 856 (2
832

(19)
3042) 3094 (1
3042
52) 3042 (58
260

(Continued on next page.)

(18 and 19 continued.)

```
     ———
     24) 416 (17
         24
         ———
         176
         168
         ———
          8) 24 (3
             24
             —
∴ G. C. M. is 8
```

```
———
442
416
———
 26) 52 (2
     52
     —
∴ G. C. M. is 26
```

(20)

```
7040) 7392 (1
      7040
      ————
      352) 7040 (20
           7040
           ————
∴ G. C. M. is 352
```

(21)

```
1441) 1572 (1
      1441
      ————
       131) 1441 (11
            131
            ———
            131
            131
            ———
∴ G. C. M. is 131
```

(22)

```
23025) 46436 (2
       46050
       —————
         386) 23025 (59
              1930
              ————
              3725
              3474
              ————
               251) 386 (1
                    251
                    ———
                    135) 251 (1
                         135
                         ———
                         116) 135 (1
                              116
                              ———
                               19) 116 (6
                                   114
    —
 2) 19 (9
    18
    —
     1) 2 (2
        2
        —
∴ No G. C. M.
```

(23)

```
21168) 204624 (9
       190512
       ——————
       14112) 21168 (1
              14112
              —————
               7056) 14112 (2
                     14112
                     —————
∴ G. C. M. is 7056
```

```
      (24)
29579) 97482 (3
       88737
       -----
        8745) 29579 (3
              26235
              -----
               3344) 8745 (2
                     6688
                     ----
                     2057) 3344 (1
                           2057
                           ----
                           1287) 2057 (1
                                 1287
                                 ----
                                  770) 1287 (1
                                        770
                                       ----
                                        517) 770 (1
                                             517
                                             ---
                                             253) 517 (2
                                                  506
                                                  ---
                                                   11) 253 (23
                                                       253
                                                       ---
                                        ∴ G. C. M. is 11
```

```
      (25)
738140) 828597 (1
        738140
        ------
         90457) 738140 (3
                723656
                ------
                 14484) 90457 (6
                        86904
                        -----
                         3553 )14484 (4
                               14212
                               -----
                                 272) 3553 (13
                                      272
                                      ----
                                       833
                                       816
                                       ---
                                        17) 272 (16
                                            17
                                            ---
                                            102
                                            102
                   ∴ G. C. M. is 17         ---
```

(26)

$$\begin{array}{l}
326337)\ 737800\ (2 \\
\qquad\quad 652674 \\
\qquad\quad \overline{85126)\ 326337\ (3} \\
\qquad\qquad\qquad 255378 \\
\qquad\qquad\qquad \overline{70959)\ 85126\ (1} \\
\qquad\qquad\qquad\qquad\quad 70959 \\
\qquad\qquad\qquad\qquad\quad \overline{14167)\ 70959\ (5} \\
\qquad\qquad\qquad\qquad\qquad\qquad 70835 \\
\qquad\qquad\qquad\qquad\qquad\qquad \overline{124)\ 14167\ (114} \\
\qquad\qquad\qquad\qquad\qquad\qquad\qquad\quad 124 \\
\qquad\qquad\qquad\qquad\qquad\qquad\qquad\quad \overline{176} \\
\qquad\qquad\qquad\qquad\qquad\qquad\qquad\quad 124 \\
\qquad\qquad\qquad\qquad\qquad\qquad\qquad\quad \overline{527} \\
\qquad\qquad\qquad\qquad\qquad\qquad\qquad\quad 496 \\
\qquad\qquad\qquad\qquad\qquad\qquad\qquad\quad \overline{31)\ 124\ (4} \\
\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\quad\ \ 124
\end{array}$$

∴ G. C. M. is 31

Ex. XXXIII. (p. 72.)

(1)

$$\begin{array}{r|rrr}
2 & 2, & 4, & 10 \\ \hline
 & & 2, & 5
\end{array}$$

∴ L. C. M. $= 2 \times 2 \times 5 = 20$

(2)

$$\begin{array}{r|rrr}
4 & 8, & 9, & 12 \\ \hline
3 & 2, & 9, & 3 \\ \hline
 & 2, & 3, & 1
\end{array}$$

∴ L. C. M. $= 4 \times 3 \times 2 \times 3 = 72$

(3)

$$\begin{array}{r|rrr}
2 & 12, & 16, & 18 \\ \hline
2 & 6, & 8, & 9 \\ \hline
3 & 3, & 4, & 9 \\ \hline
 & 1, & 4, & 3
\end{array}$$

∴ L. C. M. $= 2 \times 2 \times 3 \times 4 \times 3 = 144$

(4)

$$\begin{array}{r|rrr}
2 & 20, & 28, & 36 \\ \hline
2 & 10, & 14, & 18 \\ \hline
 & 5, & 7, & 9
\end{array}$$

∴ L. C. M. $= 2 \times 2 \times 5 \times 7 \times 9 = 1260$

(5)

$$\begin{array}{r|rrr} 2 & 16, & 24, & 30 \\ \hline 2 & 8, & 12, & 15 \\ \hline 2 & 4, & 6, & 15 \\ \hline 3 & 2, & 3, & 15 \\ \hline & 2, & 1, & 5 \end{array}$$

∴ L. C. M. $= 2 \times 2 \times 2 \times 3 \times 2 \times 5 = 240$

(6)

$$\begin{array}{r|rrr} 2 & 24, & 56, & 84 \\ \hline 2 & 12, & 28, & 42 \\ \hline 2 & 6, & 14, & 21 \\ \hline 3 & 3, & 7, & 21 \\ \hline & 1, & \cancel{7}, & 7 \end{array}$$

L. C. M. $= 2 \times 2 \times 2 \times 3 \times 7 = 168$

(7)

$$\begin{array}{r|rrr} 5 & \cancel{15}, & 25, & 105 \\ \hline & & 5, & 21 \end{array}$$

∴ L. C. M. $= 5 \times 5 \times 21 = 525$

(8)

$$\begin{array}{r|rrrr} 2 & \cancel{6}, & 33, & 24, & 32 \\ \hline 2 & & 33, & 12, & 16 \\ \hline 2 & & 33, & 6, & 8 \\ \hline 3 & & 33, & 3, & 4 \\ \hline & & 11, & 1, & 4 \end{array}$$

∴ L.C.M. $= 2 \times 2 \times 2 \times 3 \times 11 \times 4$
$= 1056$

(9)

$$\begin{array}{r|rrrrr} 2 & \cancel{7}, & 21, & 6, & 14, & 25 \\ \hline 3 & & 21, & 3, & 7, & 25 \\ \hline & & \cancel{7}, & 1, & 7, & 25 \end{array}$$

∴ L. C. M. $= 2 \times 3 \times 7 \times 25 = 1050$.

(10)

$$\begin{array}{r|rrrrr} 2 & 7, & 8, & 9, & 10, & 12 \\ \hline 2 & 7, & 4, & 9, & 5, & 6 \\ \hline 3 & 7, & 2, & 9, & 5, & \cancel{3} \\ \hline & 7, & 2, & 3, & 5, & \end{array}$$

∴ L. C. M. =
$2 \times 2 \times 7 \times 2 \times 3 \times 5 \times 3 = 2520$.

(11)

$$\begin{array}{r|rrrrr} 2 & 24, & 28, & 36, & 22, & 16 \\ \hline 2 & 12, & 14, & 18, & 11, & 8 \\ \hline 2 & 6, & 7, & 9, & 11, & 4 \\ \hline 3 & \cancel{3}, & 7, & 9, & 11, & 2 \\ \hline & & 7, & 3, & 11, & 2 \end{array}$$

∴ L. C. M. $= 2 \times 2 \times 2 \times 3 \times 7 \times 3 \times 11 \times 2 = 11088$.

(12)

$$\begin{array}{r|rrrrr} 5 & 2, & \cancel{5}, & 45, & \cancel{15}, & 25 \\ \hline & 2, & & 9; & & 5 \end{array}$$

∴ L. M. $= 5 \times 2 \times 9 \times 5 = 450$.

(13)

$$\begin{array}{r|rrrrr} 3 & \cancel{9}, & \cancel{4}, & 8, & 15, & 27, \\ \hline & & & 8, & 5, & 9 \end{array}$$

∴ L. C. M. $= 3 \times 8 \times 5 \times 9 = 1080$.

(14)

$$\begin{array}{r|rrrrr} 2 & 15, & 20, & 24, & 21, & 35 \\ \hline 2 & 15, & 10, & 12, & 21, & 35 \\ \hline 3 & 15, & 5, & 6, & 21, & 35 \\ \hline & \cancel{5}, & \cancel{5}, & 2, & \cancel{7}, & 35 \end{array}$$

∴ L. C. M. $= 2 \times 2 \times 3 \times 2 \times 35 = 840$

(15)

$$\begin{array}{r|rrrrrrr} 2 & \cancel{4}, & \cancel{5}, & \cancel{7}, & 8, & \cancel{15}, & 21, & 30 \\ \hline 3 & & & & 4, & & 21, & 15 \\ \hline & & & & 4, & & 7, & 5 \end{array}$$

∴ L. C. M. $=$
$2 \times 3 \times 4 \times 7 \times 5 = 840$

(16)

$$\begin{array}{r|rrrrrrr} 3 & \cancel{2}, & \cancel{7}, & \cancel{9}, & \cancel{13}, & 15, & 52, & 63 \\ \hline & & & & & 5, & 52, & 21 \end{array}$$

∴ L. C. M. $= 3 \times 5 \times 52 \times 21 = 16380$

(17)

$$\begin{array}{r|rrrrrr} 3 & \cancel{3}, & \cancel{7}, & 21, & \cancel{11}, & 77, & 198 \\ \hline 11 & & \cancel{7}, & & & 77, & 66 \\ \hline & & & & & 7, & 6 \end{array}$$

∴ L. C. M. $= 3 \times 11 \times 7 \times 6 = 1386.$

(18)

$$\begin{array}{r|rrrrr} 2 & 100, & 56, & \cancel{35}, & 125, & 150 \\ \hline 2 & 50, & 28, & & 125, & 75 \\ \hline 5 & \cancel{25}, & 14, & & 125, & 75 \\ \hline 5 & & 14, & & 25, & 15 \\ \hline & & 14, & & 5, & 3 \end{array}$$

∴ L. C. M. $= 2 \times 2 \times 5 \times 5 \times 14 \times 5 \times 3 = 21000.$

(19)

$$\begin{array}{r|rrrrrr} 5 & 22, & 55, & \cancel{19}, & 15, & 95, & 133 \\ \hline & 22, & \cancel{11}, & & 3, & \cancel{19}, & 133 \end{array}$$

∴ L. C. M. $=$
$5 \times 22 \times 3 \times 133 = 43890.$

(20)

$$\begin{array}{r|rrrrrr} 2 & 48, & 64, & 27, & \cancel{33}, & 110, & 165 \\ \hline 2 & 24, & 32, & 27, & & \cancel{55}, & 165 \\ \hline 2 & 12, & 16, & 27, & & & 165 \\ \hline 2 & 6, & 8, & 27, & & & 165 \\ \hline 3 & \cancel{3}, & 4, & 27, & & & 165 \\ \hline & & 4, & 9, & & & 55 \end{array}$$

∴ L. C. M. $= 2 \times 2 \times 2 \times 2 \times 3 \times 4 \times 9 \times 55 = 95040.$

Ex. XXXVII. (p. 76.)

(1) $\frac{6}{2} = 3$. (2) $\frac{5}{2} = 2\frac{1}{2}$. (3) $\frac{13}{3} = 4\frac{1}{3}$. (4) $\frac{16}{4} = 4$.
(5) $\frac{19}{6} = 3\frac{1}{6}$ (6) $\frac{47}{7} = 6\frac{5}{7}$ (7) $\frac{50}{9} = 5\frac{5}{9}$ (8) $\frac{76}{11} = 6\frac{10}{11}$
(9) $\frac{91}{13} = 7$ (10) $\frac{112}{14} = 8$ (11) $\frac{231}{27} = 8\frac{15}{27}$ (12) $\frac{804}{43} = 18\frac{30}{43}$
(13) $\frac{1000}{107} = 9\frac{37}{107}$ (14) $\frac{26540}{260} = 102\frac{20}{260}$ (15) $\frac{1718}{133} = 12\frac{122}{133}$

Ex. XXXVIII. (p. 76.)

(1) $1\frac{1}{3} = \frac{1 \times 3 + 1}{3} = \frac{4}{3}$ (2) $2\frac{1}{12} = \frac{2 \times 12 + 1}{12} = \frac{25}{12}$

(3) $1\frac{1}{15} = \frac{1 \times 15 + 1}{15} = \frac{16}{15}$ (4) $17\frac{3}{5} = \frac{17 \times 5 + 3}{5} = \frac{88}{5}$

(5) $12\frac{5}{7} = \frac{12 \times 7 + 5}{7} = \frac{89}{7}$ (6) $203\frac{17}{19} = \frac{203 \times 19 + 17}{19} = \frac{3874}{19}$

(7) $2\frac{11}{65} = \frac{2 \times 65 + 11}{65} = \frac{141}{65}$ (8) $29\frac{7}{8} = \frac{29 \times 8 + 7}{8} = \frac{239}{8}$

(9) $704\frac{12}{126} = \frac{704 \times 126 + 12}{126} = \frac{88716}{126}$

(10) $900\frac{31}{401} = \frac{900 \times 401 + 31}{401} = \frac{360931}{401}$

(11) $5\frac{7}{680} = \frac{5 \times 680 + 7}{680} = \frac{3407}{680}$

(12) $53\frac{37}{63} = \frac{53 \times 63 + 37}{63} = \frac{3376}{63}$

(13) $21\frac{3}{1250} = \frac{21 \times 1250 + 3}{1250} = \frac{26253}{1250}$

(14) $148\frac{237}{465} = \frac{148 \times 465 + 237}{465} = \frac{69057}{465}$

(15) $13\frac{1080}{2160} = \frac{13 \times 2160 + 1080}{2160} = \frac{29160}{2160}$

(16) $25\frac{385}{2400} = \frac{25 \times 2400 + 389}{2400} = \frac{60389}{2400}$

(17) $197\frac{995}{3084} = \frac{197 \times 3084 + 995}{3084} = \frac{608543}{3084}$

Ex. XXXIX. (p. 77.)

(1) $\frac{3}{4}$ of $\frac{4}{5} = \frac{3 \times \cancel{4}}{\cancel{4} \times 5} = \frac{3}{5}$

(2) $\frac{4}{5}$ of $\frac{10}{12} = \frac{\cancel{4} \times \overset{2}{\cancel{10}}}{\cancel{5} \times \underset{3}{\cancel{12}}} = \frac{2}{3}$

(3) $\frac{3}{7}$ of $\frac{21}{19} = \frac{9}{19}$

(4) $\frac{3}{10}$ of $\frac{8}{11} = \frac{12}{55}$

(5) $\frac{5}{6}$ of $2\frac{5}{8} = \frac{5}{6} \times \frac{21}{8} = \frac{35}{16}$

(6) $\frac{2}{3}$ of $1\frac{1}{4} = \frac{2}{3} \times \frac{5}{4} = \frac{5}{6}$

(7) $18\frac{2}{9}$ of $5\frac{7}{16}$ of $10 = \frac{164}{9} \times \frac{87}{16} \times \frac{10}{1} = \frac{5945}{6}$

(8) $11\frac{2}{5}$ of $8\frac{3}{7} = \frac{57}{5} \times \frac{59}{7} = \frac{3363}{35}$

(9) $\frac{5}{6}$ of $2\frac{1}{3}$ of $9 = \frac{5}{6} \times \frac{7}{3} \times \frac{9}{1} = \frac{35}{2}$

(10) $\frac{4}{7}$ of $3\frac{3}{4}$ of $3\frac{1}{2} = \frac{4}{7} \times \frac{15}{4} \times \frac{7}{2} = \frac{15}{2}$

(11) $\frac{5}{8}$ of $\frac{3}{11}$ of $\frac{22}{39}$ of $\frac{13}{45} = \frac{1}{36}$

(12) $\frac{3}{14}$ of $4\frac{5}{9}$ of $\frac{6}{37}$ of $6\frac{8}{11}$ of $\frac{7}{82} = \frac{3}{14} \times \frac{41}{9} \times \frac{6}{37} \times \frac{74}{11} \times \frac{7}{82}$
$= \frac{1}{11}$

(13) $\frac{5}{11}$ of $2\frac{1}{2}$ of $\frac{5}{7}$ of $10\frac{1}{2} = \frac{5}{11} \times \frac{5}{2} \times \frac{5}{7} \times \frac{21}{3} = \frac{375}{44}$

(14) $\frac{7}{9}$ of $12\frac{1}{2}$ of $\frac{4}{5}$ of $\frac{5}{6}$ of $\frac{3}{8}$ of $9 = \frac{7}{9} \times \frac{25}{2} \times \frac{4}{5} \times \frac{5}{6} \times \frac{3}{8} \times \frac{9}{1}$
$= \frac{175}{8}$

(15) $\frac{5}{18}$ of $\frac{7}{3}$ of $\frac{36}{10}$ of $\frac{9}{4}$ of $\frac{3}{10}$ of 2 of $\frac{8}{27} =$
$\frac{5}{18} \times \frac{7}{3} \times \frac{36}{10} \times \frac{9}{4} \times \frac{3}{10} \times \frac{2}{1} \times \frac{8}{27} = \frac{14}{15}$

(16) $\frac{5}{7}$ of $\frac{3}{8}$ of $\frac{6}{7}$ of $70\frac{2}{9}$ of $\frac{3}{40}$ of $1\frac{7}{11}$ of $147 =$

$$\frac{5}{7}\times\frac{3}{8}\times\frac{6}{7}\times\frac{632}{9}\times\frac{3}{40}\times\frac{18}{11}\times\frac{147}{1}=\frac{6399}{22}.$$

Ex XL. (p. 78.)

In each of the following examples we divide numerator and denominator by their G. C. M., or as we shall write it:

(1) $\frac{2}{4}=\frac{2\div2}{4\div2}=\frac{1}{2}.$

(2) $\frac{10}{15}=\frac{10\div5}{15\div5}=\frac{2}{3}.$

(3) $\frac{14}{21}=\frac{14\div7}{21\div7}=\frac{2}{3}.$

(4) $\frac{30}{48}=\frac{30\div6}{48\div6}=\frac{5}{8}.$

(5) $\frac{28}{63}=\frac{28\div7}{63\div7}=\frac{4}{9}.$

(6) $\frac{64}{84}=\frac{64\div4}{84\div4}=\frac{16}{21}.$

(7) $\frac{77}{121}=\frac{77\div11}{121\div11}=\frac{7}{11}.$

(8) $\frac{48}{272}=\frac{48\div16}{272\div16}=\frac{3}{17}.$

(9) $\frac{1428}{2652}=\frac{1428\div204}{2652\div204}=\frac{7}{13}.$

(10) $\frac{1408}{1664}=\frac{1408\div128}{1664\div128}=\frac{11}{13}.$

(11) $\frac{875}{1000}=\frac{875\div125}{1000\div125}=\frac{7}{8}.$

(12) $\frac{1690}{2600}=\frac{1690\div130}{2600\div130}=\frac{13}{20}.$

(13) $\frac{837}{2268}=\frac{837\div27}{2268\div27}=\frac{31}{84}.$

(14) $\frac{6006}{8008}=\frac{6006\div2002}{8008\div2002}=\frac{3}{4}.$

(15) $\frac{805}{2622}=\frac{805\div23}{2622\div23}=\frac{35}{114}.$

(16) $\frac{9504}{10692}=\frac{9504\div1188}{10692\div1188}=\frac{8}{9}.$

(17) $\frac{23111}{33759}=\frac{23111\div121}{33759\div121}=\frac{191}{279}.$

(18) $\frac{30599}{271469}=\frac{30599\div37}{271469\div37}=\frac{827}{7337}$.

(19) $\frac{5170}{8734}=\frac{5170\div22}{8734\div22}=\frac{235}{397}$.

(20) $\frac{1236}{1632}=\frac{1236\div12}{1632\div12}=\frac{103}{136}$.

(21) $\frac{285714}{999999}=\frac{285714\div142857}{999999\div142857}=\frac{2}{7}$.

(22) $\frac{10395}{16819}=\frac{10395\div11}{16819\div11}=\frac{945}{1529}$.

(23) $\frac{7040}{7392}=\frac{7040\div352}{7392\div352}=\frac{20}{21}$.

(24) $\frac{11385}{16335}=\frac{11385\div495}{16335\div495}=\frac{23}{33}$.

Ex. XLI. (p. 79.)

(1) $\frac{3}{4}$, $\frac{5}{6}$. 12 is L. C. M. of denominators;

∴ fractions become $\frac{3\times3}{4\times3}$, $\frac{5\times2}{6\times2}$ or $\frac{9}{12}$, $\frac{10}{12}$.

(2) $\frac{3}{4}$, $\frac{2}{3}$. 12 is L. C. M. of denominators;

∴ fractions become $\frac{3\times3}{4\times3}$, $\frac{2\times4}{3\times4}$ or $\frac{9}{12}$, $\frac{8}{12}$.

(3) $\frac{3}{4}$, $\frac{7}{8}$. 8 is L. C. M. of denominators;

∴ fractions become $\frac{3\times2}{4\times2}$, $\frac{7\times1}{8\times1}$ or $\frac{6}{8}$, $\frac{7}{8}$.

(4) $\frac{3}{7}$, $\frac{5}{9}$. 63 is L. C. M. of denominators;

∴ fractions become $\frac{3\times9}{7\times9}$, $\frac{5\times7}{9\times7}$ or $\frac{27}{63}$, $\frac{35}{63}$.

(5) $\frac{11}{16}$, $\frac{21}{24}$. 48 is L. C. M. of denominators;

∴ fractions become $\frac{11\times3}{16\times3}$, $\frac{21\times2}{24\times2}$ or $\frac{33}{48}$, $\frac{42}{48}$.

(6) $\frac{11}{12}, \frac{27}{40}$. 120 is L. C. M. of denominators;

∴ fractions become $\frac{11\times10}{12\times10}, \frac{27\times3}{40\times3}$ or $\frac{110}{120}, \frac{81}{120}$.

(7) $\frac{7}{10}, \frac{183}{200}$. 200 is L. C. M. of denominators;

∴ fractions become $\frac{7\times20}{10\times20}, \frac{183\times1}{200\times1}$ or $\frac{140}{200}, \frac{183}{200}$.

(8) $\frac{113}{280}, \frac{527}{960}$. 6720 is L. C. M. of denominators;

∴ fractions become $\frac{113\times24}{280\times24}, \frac{527\times7}{960\times7}$ or $\frac{2712}{6720}, \frac{3689}{6720}$.

(9) $\frac{4}{5}, \frac{11}{12}$. 60 is L. C. M. of denominators;

∴ fractions become $\frac{4\times12}{5\times12}, \frac{11\times5}{12\times5}$ or $\frac{48}{60}, \frac{55}{60}$.

(10) $\frac{3}{16}, \frac{8}{21}, \frac{5}{9}$. 1008 is L. C. M. of den$^{\text{rs}}$.; ∴ fractions become $\frac{3\times63}{16\times63}, \frac{8\times48}{21\times48}, \frac{5\times112}{9\times112}$ or $\frac{189}{1008}, \frac{384}{1008}, \frac{560}{1008}$.

(11) $\frac{7}{15}, \frac{11}{21}, \frac{23}{30}$. 210 is L. C. M. of den$^{\text{rs}}$; ∴ fractions become $\frac{7\times14}{15\times14}, \frac{11\times10}{21\times10}, \frac{23\times7}{30\times7}$ or $\frac{98}{210}, \frac{110}{210}, \frac{161}{210}$.

(12) $\frac{7}{9}, \frac{8}{11}, \frac{13}{15}, \frac{9}{17}$. 8415 is L. C. M. of den$^{\text{rs}}$.; ∴ fract$^{\text{ns}}$. become $\frac{7\times935}{9\times935}, \frac{8\times765}{11\times765}, \frac{13\times561}{15\times561}, \frac{9\times495}{17\times495}$ or $\frac{6545}{8415}$, $\frac{6120}{8415}, \frac{7293}{8415}, \frac{4455}{8415}$.

(13) $\frac{13}{14}, \frac{35}{36}, \frac{14}{15}, \frac{40}{63}$. 1260 is L. C .M. of den$^{\text{rs}}$.; ∴ fract$^{\text{ns}}$. become $\frac{13\times90}{14\times90}, \frac{35\times35}{36\times35}, \frac{14\times84}{15\times84}, \frac{40\times20}{63\times20}$ or $\frac{1170}{1260}$, $\frac{1225}{1260}, \frac{1176}{1260}, \frac{800}{1260}$.

(14) $\frac{7}{12}, \frac{17}{30}, \frac{13}{18}, \frac{15}{20}, \frac{7}{15}$. 180 is L. C. M. of denominators;

∴ fractions become $\frac{7\times15}{12\times15}, \frac{17\times6}{30\times6}, \frac{13\times10}{18\times10}, \frac{15\times9}{20\times9}$

$$\frac{7 \times 12}{15 \times 12} \text{ or } \frac{195}{180}, \frac{102}{180}, \frac{120}{180}, \frac{135}{180}, \frac{84}{180}.$$

(15) $\frac{13}{25}, \frac{27}{32}, \frac{7}{12}, \frac{15}{18}$. 7200 is L. C. M. of denrs.; ∴ fractns. become

$$\frac{13 \times 288}{25 \times 288}, \frac{27 \times 225}{32 \times 225}, \frac{7 \times 600}{12 \times 600}, \frac{15 \times 400}{18 \times 400}$$

$$\text{or } \frac{3744}{7200}, \frac{6075}{7200}, \frac{4200}{7200}, \frac{6000}{7200}.$$

(16) $\frac{9}{14}, \frac{13}{18}, \frac{7}{29}, \frac{18}{35}, \frac{23}{42}, \frac{53}{68}$. 621180 is L. C. M. of denrs.; ∴ fractions become $\frac{9 \times 44370}{14 \times 44370}, \frac{13 \times 34510}{18 \times 34510}, \frac{7 \times 21420}{29 \times 21420},$

$$\frac{18 \times 17748}{35 \times 17748}, \frac{23 \times 14790}{42 \times 14790}, \frac{53 \times 9135}{68 \times 9135} \text{ or } \frac{399330}{621180}, \frac{448630}{621180},$$

$$\frac{149940}{621180}, \frac{319464}{621180}, \frac{340170}{621180}, \frac{484155}{621180}.$$

(17) $\frac{2}{3}, \frac{4}{5}, \frac{3}{8}, \frac{14}{15}$. 120 is L. C. M. of denrs.; ∴ fractions become

$$\frac{2 \times 40}{3 \times 40}, \frac{4 \times 24}{5 \times 24}, \frac{3 \times 15}{8 \times 15}, \frac{14 \times 8}{15 \times 8} \text{ or } \frac{80}{120}, \frac{96}{120},$$

$$\frac{45}{120}, \frac{112}{120}.$$

(18) $\frac{3}{4}, \frac{5}{6}, \frac{7}{8}, \frac{9}{10}$. 120 is L. C. M. of denrs.; ∴ fractions become

$$\frac{3 \times 30}{4 \times 30}, \frac{5 \times 20}{6 \times 20}, \frac{7 \times 15}{8 \times 15}, \frac{9 \times 12}{10 \times 12} \text{ or } \frac{90}{120}, \frac{100}{120},$$

$$\frac{105}{120}, \frac{108}{120}.$$

(19) $\frac{2}{3}, \frac{5}{6}, \frac{7}{8}, \frac{5}{9}, \frac{8}{12}$. 72 is L. C. M. of denrs.; ∴ fractions become

$$\frac{2 \times 24}{3 \times 24}, \frac{5 \times 12}{6 \times 12}, \frac{7 \times 9}{8 \times 9}, \frac{5 \times 8}{9 \times 8}, \frac{8 \times 6}{12 \times 6}$$

$$\text{or } \frac{48}{72}, \frac{60}{72}, \frac{63}{72}, \frac{40}{72}, \frac{48}{72}$$

(20) $\frac{2}{3}, \frac{4}{5}, \frac{1}{2}, \frac{3}{11}$. 330 is L. C. M. of den^{rs}.; ∴ fractions become

$$\frac{2\times 110}{3\times 110}, \frac{4\times 66}{5\times 66}, \frac{1\times 165}{2\times 165}, \frac{3\times 30}{11\times 30} \text{ or } \frac{220}{330}, \frac{264}{330}, \frac{165}{330}, \frac{90}{330}.$$

Ex. XLII. (p. 80.)

(1) $\frac{2}{3}, \frac{4}{5}$; 15 is L. C. M. of den^{rs}.; ∴ fractions become

$$\frac{2\times 5}{3\times 5}, \frac{4\times 3}{5\times 3} \text{ or } \frac{10}{15}, \frac{12}{15}$$

∴ in order of magnitude the fractions stand thus, $\frac{4}{5}, \frac{2}{3}$.

(2) $\frac{7}{9}, \frac{9}{12}$; 36 is L. C. M. of den^{rs}.; ∴ fractions become

$$\frac{7\times 4}{9\times 4}, \frac{9\times 3}{12\times 3} \text{ or } \frac{28}{36}, \frac{27}{36}$$

∴ in order of magnitude the fractions stand thus, $\frac{7}{9}, \frac{9}{12}$.

(3) $\frac{17}{24}, \frac{19}{26}$; 312 is L. C. M. of den^{rs}.; ∴ fract^{ns}. become

$$\frac{17\times 13}{24\times 13}, \frac{19\times 12}{26\times 12} \text{ or } \frac{221}{312}, \frac{228}{312}$$

∴ in order of magnitude the fractions stand thus, $\frac{19}{26}, \frac{17}{24}$.

(4) $\frac{7}{9}, \frac{5}{8}, \frac{11}{14}$; 504 is L. C. M. of den^{rs}.; ∴ fract^{ns}. become

$$\frac{7\times 56}{9\times 56}, \frac{5\times 63}{8\times 63}, \frac{11\times 36}{14\times 36} \text{ or } \frac{392}{504}, \frac{315}{504}, \frac{396}{504}$$

∴ in order of magnitude the fractions stand thus, $\frac{11}{14}, \frac{7}{9}, \frac{5}{8}$.

(5) $\frac{15}{42}, \frac{22}{49}, \frac{48}{63}$; 882 is L. C. M. of den^{rs}.; ∴fract^{ns}. become

$$\frac{15\times 21}{42\times 21}, \frac{22\times 18}{49\times 18}, \frac{48\times 14}{63\times 14} \text{ or } \frac{315}{882}, \frac{396}{882}, \frac{672}{882}$$

∴ in order of magnitude the fract^{ns}. stand thus, $\frac{48}{63}, \frac{22}{49}, \frac{15}{42}$.

(6) $\frac{53}{80}, \frac{63}{90}, \frac{57}{84}$; 5040 is L. C. M. of den^{rs}.; ∴ fract^{ns}. become

$$\frac{53\times 63}{80\times 63}, \frac{63\times 56}{90\times 56}, \frac{57\times 60}{84\times 60} \text{ or } \frac{3339}{5040}, \frac{3528}{5040}, \frac{3420}{5040}$$

∴ in order of magnitude the fract^{ns}. stand thus, $\frac{63}{90}, \frac{57}{84}, \frac{53}{80}$.

(7) $\frac{3}{7}$ of $\frac{5}{9}=\frac{5}{21}$; $\frac{1}{2}$ of $\frac{3}{7}=\frac{3}{14}$; $7\frac{3}{8}=\frac{59}{8}$; 168 is L. C. M. of denominators; ∴ fractions become

$$\frac{5\times8}{21\times8},\ \frac{3\times12}{14\times12},\ \frac{59\times21}{8\times21}\text{ or }\frac{40}{168},\ \frac{36}{168},\ \frac{1239}{168}$$

∴ in order of magnitude the fractions stand thus, $7\frac{3}{8}$, $\frac{3}{7}$ of $\frac{5}{9}$, $\frac{1}{2}$ of $\frac{3}{7}$.

(8) $\frac{11}{15}$, $\frac{17}{20}$, $\frac{21}{25}$, $\frac{29}{30}$; 300 is L. C. M. of denrs; ∴ fractns. become

$$\frac{11\times20}{15\times20},\ \frac{17\times15}{20\times15},\ \frac{21\times12}{25\times12},\ \frac{29\times10}{30\times10}\text{ or }\frac{220}{300},\ \frac{255}{300},\ \frac{252}{300},\ \frac{290}{300},$$

∴ in order of magnitude the fractions stand thus, $\frac{29}{30}$, $\frac{17}{20}$, $\frac{21}{25}$, $\frac{11}{15}$.

(9) $\frac{6}{11}$ of $\frac{10}{15}$ of $7\frac{1}{4}=\frac{29}{11}$; $4\frac{1}{2}$ of $\frac{2}{33}=\frac{3}{11}$; $\frac{1}{96}$ of $7\frac{1}{2}$ of $11=\frac{55}{64}$; $\frac{3}{6}$ of $4\frac{1}{6}$ of $14\frac{7}{11}=\frac{1610}{99}$; 6336 is L. C. M. of denominators; ∴ fractions become

$$\frac{29\times576}{11\times576},\ \frac{3\times576}{11\times576},\ \frac{55\times99}{64\times99},\ \frac{1610\times64}{99\times74}\text{ or }\frac{16704}{6336},\ \frac{1728}{6336},\ \frac{5445}{6335},\ \frac{103040}{6336}$$

∴ in order of magnitude the fractns. stand thus, $\frac{3}{6}$ of $4\frac{1}{6}$, of $\frac{4}{9}$ of $14\frac{7}{11}$, $\frac{6}{11}$ of $\frac{10}{15}$ $7\frac{1}{4}$, $\frac{1}{96}$ of $7\frac{1}{2}$ of 11, $4\frac{1}{2}$ of $\frac{2}{33}$.

(10) $\frac{684}{765}$ of $\frac{85}{171}=\frac{4}{9}$; $\frac{15}{17}$ of $6\frac{4}{5}$ of $\frac{11}{50}$ of $1\frac{4}{21}=\frac{11}{7}$; $1\frac{6}{7}$ of $1\frac{1}{3}$ of $5\frac{1}{39}$ of $\frac{1}{2}$ of $1\frac{2}{28}=\frac{20}{3}$; 63 is L. C. M. of denominators; ∴ fractions become

$$\frac{4\times7}{9\times7},\ \frac{11\times9}{7\times9},\ \frac{20\times21}{3\times21},\text{ or }\frac{28}{63},\ \frac{99}{63},\ \frac{420}{63}$$

∴ in order of magnitude the fractions$1\frac{6}{7}$ of $1\frac{1}{3}$ of $5\frac{1}{39}$ of $\frac{1}{2}$ of $1\frac{2}{28}$, $\frac{15}{17}$ of $6\frac{4}{5}$ of $\frac{11}{50}$ of $1\frac{4}{21}$, $\frac{684}{765}$ of $\frac{85}{171}$.

(11) $\frac{5}{7}$, $\frac{3}{5}$; 35 is L. C. M. of denrs.; ∴ fractions become

$$\frac{5\times5}{7\times5},\ \frac{3\times7}{5\times7}\text{ or }\frac{25}{35},\ \frac{21}{35},\ \frac{25}{35}-\frac{21}{35}=\frac{4}{35}$$

∴ $\frac{5}{7}$ of a yard is greater by $\frac{4}{35}$ of a yard.

(12) $\frac{1}{2}$, $\frac{2}{3}$; 6 is L. C. M. of denrs.; ∴ fractions become

$$\frac{1\times 3}{2\times 3},\ \frac{2\times 2}{3\times 2}\text{ or }\frac{3}{6},\ \frac{4}{6}.\ \ \frac{4}{6}-\frac{3}{6}=\frac{1}{6}$$

∴ $\frac{2}{3}$ of a yard is the greater by $\frac{1}{6}$ of a yard.

(13) $1\frac{7}{8}$ of $\frac{3}{11}$ of $1\frac{2}{3}$ of $\frac{22}{45}=\frac{5}{12}$; $\frac{5}{6}$ of $\frac{7}{110}$ of $5\frac{1}{2}=\frac{7}{24}$; 24 is L C. M. of denominators; ∴ fractions become

$$\frac{5\times 2}{12\times 2},\ \frac{7\times 1}{24\times 1}\text{ or }\frac{10}{24},\ \frac{7}{24},\ \ \frac{10}{24}-\frac{7}{24}=\frac{3}{24}$$

∴ $1\frac{7}{8}$ of $\frac{3}{11}$ of $1\frac{2}{3}$ of $\frac{22}{45}$ is the greater by $\frac{3}{24}$ of a loaf.

Ex. XLIII. (p. 82.)

(1) $\frac{1}{3}+\frac{2}{7}=\frac{7+6}{21}=\frac{13}{21}$. (2) $\frac{3}{4}+\frac{2}{3}=\frac{9+8}{12}=\frac{17}{12}=1\frac{5}{12}$.

(3) $3+\frac{1}{3}=3\frac{1}{3}$. (4) $\frac{3}{4}+\frac{5}{6}=\frac{9+10}{12}=\frac{19}{12}=1\frac{7}{12}$.

(5) $\frac{5}{12}+\frac{7}{15}=\frac{25+28}{60}=\frac{53}{60}$.

(6) $\frac{3}{4}+\frac{7}{12}=\frac{9+7}{12}=\frac{16}{12}=1\frac{4}{12}=1\frac{1}{3}$.

(7) $\frac{3}{5}+\frac{5}{11}=\frac{33+25}{55}=\frac{58}{55}=1\frac{3}{55}$.

(8) $\frac{3}{8}+\frac{5}{14}=\frac{21+20}{56}=\frac{41}{56}$. (9) $\frac{11}{30}+\frac{2}{45}=\frac{33+4}{90}=\frac{37}{90}$.

(10) $1\frac{1}{3}+1\frac{1}{6}=\frac{4}{3}+\frac{7}{6}=\frac{8+7}{6}=\frac{15}{6}=2\frac{3}{6}=2\frac{1}{2}$.

(11) $7\frac{3}{6}+8=7+8+\frac{3}{6}=15\frac{3}{6}=15\frac{1}{2}$.

(12) $1\frac{1}{3}$ of $2\frac{1}{2}=\frac{4}{3}$ of $\frac{5}{2}=\frac{10}{3}=3\frac{1}{3}$; $3\frac{1}{3}+6\frac{1}{4}=3+6+$

$$\frac{1}{3}+\frac{1}{4}=9+\frac{4+3}{12}=9\frac{7}{12}.$$

(13) $\frac{3}{4}+\frac{4}{5}+\frac{7}{12}=\frac{45+48+35}{60}=\frac{128}{60}=2\frac{8}{60}=2\frac{2}{15}.$

(14) $2\frac{3}{8}+\frac{5}{18}+3\frac{1}{12}=2+3+\frac{3}{8}+\frac{5}{18}+\frac{1}{12}=5+\frac{27+20+6}{72}=$

$$5+\frac{53}{72}=5\frac{53}{72}.$$

(15) $\frac{1}{3}$ of $1\frac{3}{7}=\frac{1}{3}$ of $\frac{10}{7}=\frac{10}{21}$; $6\frac{3}{14}+\frac{10}{21}+2\frac{7}{9}=6+2+\frac{3}{14}$

$$+\frac{10}{21}+\frac{7}{9}=8+\frac{27+60+98}{126}=8+\frac{185}{126}=9\frac{59}{126}.$$

(16) $9\frac{1}{2}$ of $2\frac{1}{3}=\frac{19}{2}\times\frac{7}{3}=\frac{133}{6}=22\frac{1}{6}$; $22\frac{1}{6}+\frac{13}{18}+\frac{1}{27}=22$

$$+\frac{1}{6}+\frac{13}{18}+\frac{1}{27}=22+\frac{9+39+2}{54}=22+\frac{50}{54}=22\frac{25}{27}.$$

(17) $\frac{1}{3}$ of $(1+1\frac{1}{3})=\frac{1}{3}$ of $2\frac{1}{3}=\frac{1}{3}$ of $\frac{7}{3}=\frac{7}{9}$; $\frac{2}{3}+\frac{5}{6}+\frac{7}{9}=$

$$\frac{12+15+14}{18}=\frac{41}{18}=2\frac{5}{18}.$$

(18) $\frac{1}{2}+\frac{2}{3}+\frac{3}{4}+\frac{4}{5}=\frac{30+40+45+48}{60}=\frac{163}{60}=2\frac{43}{60}.$

(19) $2\frac{1}{2}+3\frac{1}{3}+4\frac{1}{4}+5\frac{1}{5}=2+3+4+5+\frac{1}{2}+\frac{1}{3}+\frac{1}{4}+\frac{1}{5}=14+$

$$\frac{30+20+15+12}{60}=14+\frac{77}{60}=14+1\frac{17}{60}=15\frac{17}{60}.$$

(20) $5\frac{7}{24}+13\frac{5}{32}+\frac{49}{72}+2\frac{23}{60}=5+13+2+\frac{7}{24}+\frac{5}{32}+\frac{49}{72}+\frac{23}{60}$
$=20+\frac{1680+900+3920+2208}{5760}=20+\frac{8708}{5760}=20+1+$
$\frac{2948}{5760}=20+1\frac{737}{1440}=21\frac{737}{1440}$

(21) $4\frac{5}{9}+\frac{7}{15}+16\frac{9}{20}+25\frac{13}{25}=4+16+25+\frac{5}{9}+\frac{7}{15}+\frac{9}{20}+\frac{13}{25}$
$=45+\frac{500+420+405+468}{900}=45+\frac{1793}{900}=45+1\frac{893}{900}$
$=46\frac{893}{900}$

(22) $\frac{2}{5}$ of $3\frac{3}{4}=\frac{2}{5}$ of $\frac{15}{4}=\frac{3}{2}=1\frac{1}{2}$; $3\frac{8}{9}+16\frac{7}{8}+7\frac{5}{12}+1\frac{1}{2}=3$
$+16+7+1+\frac{64+63+30+36}{72}=27+\frac{193}{72}=27+2\frac{49}{72}$
$=29\frac{49}{72}$

(23) $(2\frac{3}{4}+3\frac{2}{3})$ of $2\frac{5}{11}+3\frac{1}{5}$ of $(16\frac{5}{8}+3\frac{1}{4})+1\frac{2}{3}$ of 11 of $2\frac{1}{22}=$
$\left(2+3+\frac{3}{4}+\frac{2}{3}\right)$ of $\frac{27}{11}+\frac{16}{5}$ of $\left(16+3+\frac{5}{8}+\frac{1}{4}\right)+\frac{5}{3}$ of $\Big(11$
of $\frac{45}{22}\Big)=\left(5+\frac{9+8}{12}\right)$ of $\frac{27}{11}+\frac{16}{5}$ of $\left(19+\frac{5+2}{8}\right)+\frac{75}{2}=$
$6\frac{5}{12}$ of $\frac{27}{11}+\frac{16}{5}$ of $19\frac{7}{8}+\frac{75}{2}=\frac{77}{12}$ of $\frac{27}{11}+\frac{16}{5}$ of $\frac{159}{8}+\frac{75}{2}$
$=\frac{63}{4}+\frac{318}{5}+\frac{75}{2}=15\frac{3}{4}+63\frac{3}{5}+37\frac{1}{2}=15+63+37+\frac{3}{4}+$
$\frac{3}{5}+\frac{1}{2}=115+\frac{15+12+10}{20}=115+\frac{37}{20}=115+1\frac{17}{20}=$
$116\frac{17}{20}$.

(24) $$£2\frac{13}{18}+£\frac{19}{24}+£3\frac{1}{12}+£4\frac{13}{16}+£\frac{20}{48}=£2+£3+£4+$$
$$£\frac{13}{18}+£\frac{19}{24}+£\frac{1}{12}+£\frac{13}{16}+£\frac{20}{48}=£9+$$
$$£\frac{104+114+12+117+60}{144}=£2\frac{119}{144}+£9=£11\frac{119}{144}$$

(25) $$\frac{3}{10}\text{ of 4 lbs.}+\frac{5}{12}\text{ of 4 lbs.}+\frac{7}{15}\text{ of 4 lbs.}+\frac{9}{20}\text{ of 4 lbs.}+$$
$$\frac{14}{27}\text{ of 4 lbs.}+4\frac{11}{15}=1\frac{1}{5}\text{ lbs.}+1\frac{2}{3}\text{ lbs.}+1\frac{13}{15}\text{ lbs.}+1\frac{4}{5}\text{ lbs.}$$
$$+2\frac{2}{27}\text{lbs.}+4\frac{11}{15}\text{ lbs.}=\Bigl(1+1+1+1+2+4+\frac{1}{5}+\frac{2}{3}+\frac{13}{15}+\frac{4}{5}$$
$$+\frac{2}{27}+\frac{11}{15}\Bigr)\text{ lbs.}=10\text{ lbs.}+\frac{27+90+117+108+10+99}{135}\text{lbs.}$$
$$=10\text{ lbs.}+\frac{451}{135}\text{ lbs.}=10\text{ lbs.}+3\frac{46}{135}\text{ lbs.}=13\frac{46}{135}\text{ lbs.}$$

Ex. XLIV. (p. 83.)

(1) $\frac{1}{4}-\frac{1}{5}=\frac{5-4}{20}=\frac{1}{20}$. (2) $\frac{1}{2}-\frac{1}{8}=\frac{4-1}{8}=\frac{3}{8}$.

(3) $\frac{3}{4}-\frac{5}{12}=\frac{9-5}{12}=\frac{4}{12}=\frac{1}{3}$. (4) $\frac{19}{24}-\frac{13}{18}=\frac{57-52}{72}=\frac{5}{72}$.

(5) $3\frac{2}{3}-2\frac{1}{6}=3-2+\frac{4-1}{6}=1+\frac{3}{6}=1\frac{1}{2}$.

(6) $7-2\frac{9}{10}=7-3+\frac{10-9}{10}=4+\frac{1}{10}=4\frac{1}{10}$.

(7) $10\frac{1}{12}-8\frac{1}{9}=10\frac{13}{12}-9\frac{1}{9}=1+\left(\frac{13}{12}-\frac{1}{9}\right)=1+\frac{39-4}{36}=$
$1\frac{35}{36}.$

(8) $17\frac{3}{4}-13\frac{5}{6}=17\frac{7}{4}-14\frac{5}{6}=3+\left(\frac{7}{4}-\frac{5}{6}\right)=3+$
$\frac{21-10}{12}=3\frac{11}{12}.$

(9) $1\frac{4}{25}-\frac{3}{4}=1\frac{29}{25}-1\frac{3}{4}=\frac{116-75}{100}=\frac{41}{100}$

(10) $4\frac{3}{7}-2\frac{17}{20}=4\frac{10}{7}-3\frac{17}{20}=1+\frac{200-119}{140}=1+$
$\frac{81}{140}=1\frac{81}{140}.$

(11) $15\frac{3}{7}-7\frac{2}{3}=15\frac{10}{7}-8\frac{2}{3}=7+\frac{30-14}{21}=7+\frac{16}{21}=7\frac{16}{21}.$

(12) $20\frac{5}{18}-8\frac{3}{56}=20\frac{23}{18}-9\frac{3}{56}=11+\frac{644-27}{504}=$
$11+\frac{617}{504}=11+1\frac{113}{504}=12\frac{113}{504}.$

(13) $1-\frac{3}{5}=\frac{5-3}{5}=\frac{2}{5};\ \frac{3}{5}-\frac{2}{5}=\frac{1}{5}.$

(14) (1) $\frac{13}{12}-\frac{7}{36}=\frac{39-7}{36}=\frac{32}{36}=\frac{8}{9};$

(2) $8\frac{1}{2}-2\frac{4}{5}=8\frac{3}{2}-3\frac{4}{5}=5+\frac{3}{2}-\frac{4}{5}=5+$
$\frac{15-8}{8}=5\frac{7}{10}$

(15) $\frac{5}{8}\text{d.}-\frac{5}{9}\text{d.}=\frac{45-40}{72}\text{d.}=\frac{5}{72}\text{d.}$

Ex. XLV. (p. 84.)

$$(1)\ \tfrac{1}{6}+2\tfrac{1}{7}+13\tfrac{3}{10}-3\tfrac{3}{70}=2+13-3+\frac{1}{6}+\frac{1}{7}+\frac{3}{10}-\frac{3}{70}=12$$
$$+\frac{35+30+63-9}{210}=12+\frac{119}{210}=12\frac{119}{210}.$$

$$(2)\ \tfrac{1}{4}-\tfrac{3}{8}+\tfrac{5}{6}-\tfrac{13}{24}=\frac{6-9+20-13}{24}=\frac{6+20-9-13}{24}$$
$$=\frac{4}{24}=\frac{1}{6}.$$

$$(3)\ 12\tfrac{11}{17}-\tfrac{21}{34}+7\tfrac{16}{51}-\tfrac{1}{3}\text{ of }\tfrac{16}{17}+\tfrac{2}{5}\text{ of }3\tfrac{3}{4}=12\frac{11}{17}-\frac{21}{34}+7\frac{16}{51}$$
$$-\frac{16}{51}+\frac{3}{2}=12+7+1+\frac{11}{17}-\frac{21}{34}+\frac{16}{51}-\frac{16}{51}+\frac{1}{2}=20+$$
$$\frac{66-63+32-32+51}{102}=20+\frac{54}{102}=20\frac{9}{17}.$$

$$(4)\ (16\tfrac{5}{8}-3\tfrac{1}{4})\text{ of }3\tfrac{1}{5}-16\tfrac{5}{8}+(3\tfrac{1}{4}\text{ of }3\tfrac{1}{5})=\left(16-3+\frac{5-2}{8}\right)$$
$$\text{of }\frac{16}{5}-16\frac{5}{8}+\left(\frac{13}{4}\text{ of }\frac{16}{5}\right)=13\frac{3}{8}\times\frac{16}{5}-16\frac{5}{8}+10\frac{2}{5}=\frac{107}{8}$$
$$\times\frac{16}{5}-16\frac{5}{8}+10\frac{2}{5}=42\frac{4}{5}-16\frac{5}{8}+10\frac{2}{5}=42-16+10+$$
$$\frac{32-25+16}{40}=36+\frac{23}{40}=36\frac{23}{40}.$$

$$(5)\ 6\tfrac{1}{4}+\tfrac{7}{12}\text{ of }\tfrac{9}{14}\text{ of }3\tfrac{1}{3}-\tfrac{45}{60}-5\tfrac{3}{4}=6\frac{1}{4}+\left(\frac{7}{12}\times\frac{9}{14}\times\frac{10}{3}\right)-$$
$$\frac{45}{60}-5\frac{3}{4}=6+1-5+\frac{15+15-45-45}{60}=1+\frac{60-60}{60}=1.$$

(6) $6\frac{1}{4}+\frac{7}{12}$ of $\frac{9}{14}$ of $(3\frac{1}{3}-\frac{45}{60})-5\frac{3}{4}=6\frac{1}{4}+\frac{7}{12}$ of $\frac{9}{14}$ of $\left(3\frac{4}{3}-1\frac{45}{60}\right)-5\frac{3}{4}=6\frac{1}{4}+\frac{7}{12}$ of $\frac{9}{14}$ of $\left(2+\frac{80-45}{60}\right)-5\frac{3}{4}$ $=6\frac{1}{4}+\frac{7}{12}$ of $\frac{9}{14}$ of $\frac{31}{12}-5\frac{3}{4}=6\frac{1}{4}+\frac{31}{32}-5\frac{3}{4}=6-5+$ $\frac{8+31-24}{32}=1\frac{15}{32}$.

(7) $5\frac{89}{120}-\left(\frac{4}{5}+\frac{7}{8}+\frac{11}{12}\right)=5\frac{89}{120}-\left(\frac{96+105+110}{120}\right)=$ $5\frac{89}{120}-2\frac{71}{120}=5-2+\frac{89-71}{120}=3+\frac{18}{120}=3\frac{3}{20}$.

(8) $\frac{1}{3}$ of $\frac{3}{4}=\frac{1}{4}=$ B's pur ; $\frac{3}{4}-\frac{1}{4}=\frac{2}{4}=\frac{1}{2}$ rem'r.

$\frac{1}{3}$ of $\frac{1}{2}=\frac{1}{6}=$ C's pur. ; $\frac{1}{2}-\frac{1}{6}=\frac{3-1}{6}=\frac{2}{6}=\frac{1}{3}$ rem'r.

$\frac{1}{3}$ of $\frac{1}{3}=\frac{1}{9}=$ D's pur. ; $\frac{1}{3}-\frac{1}{9}=\frac{3-1}{9}=\frac{2}{9}=$ A's rem'r.

Ex. XLVI. (p. 86.)

(1) $\frac{1}{9}\times\frac{3}{4}=\frac{1}{12}$. (2) $\frac{7}{9}\times\frac{5}{8}=\frac{35}{72}$. (3) $\frac{4}{13}\times\frac{5}{82}=\frac{5}{26}$.

(4) $\frac{7}{8}\times\frac{2}{21}=\frac{1}{12}$. (5) $7\frac{1}{2}\times 3\frac{1}{3}=\frac{15}{2}\times\frac{10}{3}=25$.

(6) $\frac{3}{4}$ of $\frac{1}{5}\times 17\frac{1}{2}=\frac{3}{4}\times\frac{1}{5}\times\frac{35}{2}=\frac{21}{8}=2\frac{5}{8}$.

(7) $\frac{7}{12}$ of $1\frac{1}{7}\times 3\frac{3}{20}\times\frac{13}{84}=\frac{7}{12}\times\frac{8}{7}\times\frac{63}{20}\times\frac{13}{84}=\frac{13}{40}$.

(8) $\frac{5}{6}\times 3\frac{2}{11}\times 19\frac{1}{5}\times\frac{11}{56}=\frac{5}{6}\times\frac{35}{11}\times\frac{96}{5}\times\frac{11}{56}=10$.

(9) $\frac{7}{18}$ of $1\frac{1}{10}$ of $1\frac{13}{14}\times 2\frac{1}{2}\times 2\frac{2}{7}=\frac{7}{18}\times\frac{11}{10}\times\frac{27}{14}\times\frac{5}{2}\times\frac{16}{7}=$

$$\frac{33}{7}=4\frac{5}{7}.$$

(10) $\frac{11}{16}$ of $3\frac{3}{4}\times 4\frac{4}{5}$ of $2\frac{1}{22}\times 13=\frac{11}{16}\times\frac{15}{4}\times\frac{24}{5}\times\frac{45}{22}\times\frac{13}{1}=$

$$\frac{5265}{16}=329\frac{1}{16}.$$

(11) $2\frac{11}{23}$ of $(4\frac{1}{5}+3\frac{5}{14})\times\frac{11}{91}$ of $2\frac{1}{19}\times 1\frac{1}{69}=\frac{57}{23}\times\Big(4+3+$

$$\frac{14+25}{70}\Big)\times\frac{11}{91}\times\frac{39}{19}\times\frac{70}{69}=\frac{57}{23}\times\frac{529}{70}\times\frac{11}{91}\times\frac{39}{19}\times\frac{70}{69}=\frac{33}{7}$$

$$=4\frac{5}{7}.$$

(12) $(3\frac{5}{6}-1\frac{7}{12}+1\frac{4}{9}-2\frac{11}{72})\times 38\frac{1}{4}$ of $\frac{2}{17}=\Big(3-1+1-2+$

$$\frac{60-42+32-11}{72}\Big)\times\frac{153}{4}\times\frac{2}{17}=\frac{37}{24}\times\frac{153}{4}\times\frac{2}{17}=\frac{111}{16}=6\frac{15}{16}.$$

(13) $\frac{3}{4}$ of $(\frac{1}{3}+\frac{1}{5}-\frac{4}{15}+\frac{1}{9})\times\frac{2}{3}$ of $(2\frac{3}{16}+\frac{5}{8})=\frac{3}{4}$ of

$$\left(\frac{15+9-12+5}{45}\right)\times\frac{2}{3}\text{ of }\left(2+\frac{3+10}{16}\right)=\frac{3}{4}\times\frac{17}{45}\times\frac{2}{3}\times\frac{45}{16}$$

$$=\frac{17}{32}.$$

(14) $\Big\{(\frac{1}{2}+\frac{1}{3})$ of $(1\frac{1}{3}+2\frac{3}{4})\Big\}\times\Big\{(2\frac{1}{14}-1\frac{1}{2})$ of $(3\frac{1}{10}-\frac{3}{7})\Big\}=$

$$\left(\frac{3+2}{6}\right)\times\left(1+2+\frac{4+9}{12}\right)\times\left(2-1+\frac{1-7}{14}\right)\text{of}\left(3+\frac{7-30}{70}\right)$$

$$=\frac{5}{6}\times\frac{49}{12}\times\frac{4}{7}\times\frac{187}{70}=\frac{187}{36}=5\frac{7}{36}.$$

(15) $\left\{1\frac{3}{7} \text{ of } 26\frac{1}{2} \text{ of } \left(1-\frac{2}{3}\right)\right\} \times \left\{2\frac{5}{8} \text{ of } \left(4\frac{1}{5}-3\frac{2}{3}\right) \text{ of } \frac{45}{106}\right\}$

$$\frac{10}{7} \text{ of } \frac{53}{2} \text{ of } \frac{1}{3} \times \left(2\frac{5}{8} \text{ of } \frac{8}{15} \text{ of } \frac{45}{106}\right) = \frac{10}{7} \times \frac{53}{2} \times \frac{1}{3} \times \frac{21}{8} \times \frac{8}{15} \times \frac{45}{106} = \frac{15}{2} = 7\frac{1}{2}.$$

Ex. XLVII. (p. 86.)

(1) $\frac{15}{20} \div \frac{5}{7} = \frac{15 \times 7}{20 \times 5} = \frac{21}{20} = 1\frac{1}{20}.$

(2) $\frac{2}{5} \div \frac{3}{5} = \frac{2 \times 5}{5 \times 3} = \frac{2}{3}.$

(3) $\frac{6}{11} \div \frac{3}{5} = \frac{6 \times 5}{11 \times 3} = \frac{10}{11}.$

(4) $4\frac{5}{6} \div 6\frac{7}{8} = \frac{29}{6} \div \frac{55}{8} = \frac{29 \times 8}{6 \times 55} = \frac{116}{165}.$

(5) $56 \div 5\frac{5}{7} = 56 \div \frac{40}{7} = \frac{56 \times 7}{1 \times 40} = \frac{49}{5} = 9\frac{4}{5}.$

(6) $7\frac{5}{7} \div 4\frac{2}{21} = \frac{54}{7} \div \frac{86}{21} = \frac{54 \times 21}{7 \times 86} = \frac{81}{43} = 1\frac{38}{43}.$

(7) $\frac{1}{3} \text{ of } 20\frac{3}{4} \div 10\frac{3}{8} = \frac{1}{3} \times \frac{83}{4} \div \frac{83}{8} = \frac{83}{12} \times \frac{8}{83} = \frac{2}{3}.$

(8) $\frac{3}{5} \text{ of } 5\frac{1}{2} \div \frac{5}{22} \text{ of } 9 = \frac{3}{5} \times \frac{11}{2} \div \frac{5}{22} \times \frac{9}{1} = \frac{33}{10} \div \frac{45}{22} = \frac{33 \times 22}{10 \times 45} = 1\frac{46}{75}.$

(9) $\left(\frac{3}{5} \text{ of } 7\frac{1}{2} - \frac{8}{17}\right) \div 1\frac{2}{9} = \left\{\left(\frac{3}{5} \times \frac{15}{2}\right) - \frac{8}{17}\right\} \div \frac{11}{9} = \left(\frac{9}{2} - \frac{8}{17}\right) \div \frac{11}{9} = \frac{137}{34} \div \frac{11}{9} = \frac{137 \times 9}{34 \times 11} = 3\frac{111}{374}.$

$$(10)\ (\tfrac{1}{5}+\tfrac{3}{4}-\tfrac{1}{2}) \div (\tfrac{4}{5}+\tfrac{2}{3}) = \frac{4+15-10}{20} \div \frac{12+10}{15} = \frac{9}{20} \div \frac{22}{15} = \frac{9 \times 15}{20 \times 22} = \frac{27}{85}.$$

$$(11)\ 6\tfrac{3}{4} \div 216 = \frac{27}{4} \div 216 = \frac{27 \times 1}{4 \times 216} = \frac{1}{32}.$$

$$(12)\ \tfrac{3}{4} \div 2 = \frac{3 \times 1}{4 \times 2} = \frac{3}{8}.$$

$$(13)\ \frac{4+\frac{1}{4}}{4-\frac{1}{4}} = \frac{4\frac{1}{4}}{3\frac{3}{4}} = \frac{17}{4} \div \frac{15}{4} = \frac{17 \times 4}{4 \times 15} = \frac{17}{15} = 1\frac{2}{15};$$

2 is the next whole number; $2-1\frac{2}{15}=\frac{13}{15}$.

Ex. XLVIII. (p. 87.)

$$(1)\ \frac{6\frac{1}{7}}{3\frac{1}{9}} = \tfrac{43}{7} \div \tfrac{28}{9} = \tfrac{43}{7} \times \tfrac{9}{28} = \tfrac{387}{196} = 1\tfrac{191}{196}.$$

$$(2)\ \frac{6}{2\frac{1}{4}} = 6 \div \tfrac{9}{4} = 6 \times \tfrac{4}{9} = \tfrac{8}{3} = 2\tfrac{2}{3}.$$

$$(3)\ \frac{2\frac{1}{4}}{6} = \tfrac{9}{4} \div 6 = \tfrac{9}{4} \times \tfrac{1}{6} = \tfrac{3}{8}.$$

$$(4)\ \frac{6\frac{5}{12}}{3\frac{2}{3}} = \tfrac{77}{12} \div \tfrac{11}{3} = \tfrac{77}{12} \times \tfrac{3}{11} = \tfrac{7}{4} = 1\tfrac{3}{4}.$$

$$(5)\ \frac{5}{2\frac{5}{8}} = 5 \div \tfrac{21}{8} = 5 \times \tfrac{8}{21} = \tfrac{40}{21} = 1\tfrac{19}{21}.$$

$$(6)\ \frac{\frac{7}{45}}{4\frac{1}{36}} = \frac{7}{45} \div \frac{145}{36} = \frac{7}{45} \times \frac{36}{145} = \frac{28}{725}.$$

$$(7)\ \frac{1\frac{3}{4} \text{ of } 1\frac{1}{7}}{1\frac{2}{3} \text{ of } \frac{6}{11}} = \frac{\frac{7}{4} \times \frac{8}{7}}{\frac{5}{3} \times \frac{6}{11}} = 2 \times \tfrac{11}{10} = \tfrac{11}{5} = 2\tfrac{1}{5}.$$

$$(8)\ \frac{\frac{7}{9}+\frac{3}{7}}{2\frac{3}{7}} = \frac{\frac{76}{63}}{\frac{17}{7}} = \tfrac{76}{63} \times \tfrac{7}{17} = \tfrac{76}{153}.$$

$$(9)\ \frac{5\frac{1}{2}+6\frac{3}{7}}{6\frac{3}{7}-5\frac{1}{2}} = \frac{11\frac{13}{14}}{\frac{13}{14}} = \frac{\frac{157}{14}}{\frac{13}{14}} = \tfrac{157}{14} \times \tfrac{14}{13} = \tfrac{157}{13} = 12\tfrac{11}{13}.$$

(10) $\dfrac{\frac{1}{2\frac{1}{2}}+\frac{1}{3\frac{1}{3}}+\frac{1}{4\frac{1}{4}}}{\frac{8}{9}+\frac{5}{6}-\frac{11}{12}}=\dfrac{\frac{2}{5}+\frac{3}{10}+\frac{4}{17}}{\frac{8}{9}+\frac{5}{6}-\frac{11}{12}}=\dfrac{\frac{159}{170}}{\frac{29}{36}}=\frac{159}{170}\times\frac{36}{29}=1\frac{397}{2465}$

(11) $\left\{\dfrac{3\frac{1}{3}}{7}+\dfrac{2}{10\frac{1}{2}}-\frac{5}{18}\text{ of }\frac{4}{7}\right\}\times 1\frac{3}{4}=(\frac{10}{21}+\frac{4}{21}-\frac{10}{63})\times\frac{7}{4}=\frac{32}{63}$
$\times\frac{7}{4}=\frac{8}{9}$.

(12) $\left(\dfrac{5\frac{5}{7}}{31\frac{5}{6}}\text{ of }\frac{9}{14}\right)\div\left(\dfrac{3\frac{2}{3}}{3\frac{3}{4}}\text{ of }15\right)=\frac{40}{7}\times\frac{6}{191}\times\frac{9}{14}\div\frac{11}{3}\times\frac{4}{15}$
$\times 15=\frac{1080}{9359}\div\frac{44}{3}=\frac{1080}{9359}\times\frac{3}{44}=\frac{810}{102949}$.

(13) $\dfrac{5\frac{2}{7}\div 7\frac{2}{5}}{2\frac{3}{8}-1\frac{4}{7}}\text{ of }\dfrac{2\frac{1}{4}\times 8\frac{1}{3}}{4\frac{1}{9}\div(\frac{1}{8}-\frac{1}{9})}=\dfrac{\frac{5}{7}}{\frac{45}{56}}\text{ of }\dfrac{\frac{75}{4}}{\frac{296}{1}}=\frac{25}{444}$.

(14) $\dfrac{13}{2\frac{2}{3}+\frac{1}{4}}+\dfrac{1\frac{1}{8}}{2\frac{7}{10}}-1\frac{3}{16}=4\frac{16}{35}+\frac{5}{12}-1\frac{3}{16}=3\frac{1153}{1680}$.

Ex. XLIX. (p. 88.)

(1) $\dfrac{2}{5}$ of \$1 $=\dfrac{2\times 100}{5}$ cts. = 40 cts.

(2) $\dfrac{3}{8}$ ml. $=\dfrac{3\times 8}{8}$ fur. = 3 fur.

(3) $\dfrac{3}{7}$ cwt. $=\dfrac{3\times 4}{7}$ qrs. $=1\frac{5}{7}$ qrs; $\dfrac{5}{7}$ qr. $=\dfrac{5\times 25}{7}$ lbs. $=17\frac{6}{7}$ lbs; $\dfrac{6}{7}$ lb. $=\dfrac{6\times 16}{7}$ oz. $=13\frac{5}{7}$ oz.; $\dfrac{5}{7}$ oz. $=\dfrac{5\times 16}{7}$ drs. $=11\frac{3}{7}$ drs.: ∴ value is 1 qr., 17 lbs., 13 oz., $11\frac{3}{7}$ drs.

(4) $\frac{9}{20}$ of 2 tons, 3 cwt. $= \frac{9 \times 43}{20}$ cwt. $= 19\frac{7}{20}$ cwt.; $\frac{7}{20}$ cwt. $= \frac{7 \times 4}{20}$ qrs. $= 1\frac{8}{20}$ qrs.; $\frac{8}{20}$ qrs. $= \frac{8 \times 25}{20}$ lbs. $=$ 10 lbs.;

∴ value is 19 cwt. 1qr. 10 lbs.

(5) $\frac{3}{16}$ of 3 mls., 2 fur., $= \frac{3 \times 26}{16}$ fur. $= 4\frac{7}{8}$ fur.; $\frac{7}{8}$ fur. $=$ $\frac{7 \times 40}{8}$ per. $=$ 35 per.; ∴ value is 4 fur. 35 per.

(6) $\frac{4}{5}$ of 3 ac., 2 per., 3 yds. $= \frac{(3 \text{ ac., } 2 \text{ per., } 3 \text{ yds.}) \times 4}{5} =$ $\frac{12 \text{ ac., } 8 \text{ per., } 12 \text{ yds.}}{5} =$ 2 ac., 1 ro., 25 per., 20 yds., 4 ft., 136$\frac{4}{5}$ in.

(7) $\frac{5}{6}$ of 5 lbs., 13 dwts. $= \frac{(5 \text{ lbs., } 13 \text{ dwts.}) \times 5}{6} =$ $\frac{25 \text{ lbs., } 3 \text{ oz., } 5 \text{ dwts.}}{6} =$ 4 lbs., 2 oz., 10 dwts., 20 grs.

(8) $\frac{7}{8}$ of 68 yds., 2 nls. $= \frac{(68 \text{ yds., } 2 \text{ nls.}) \times 7}{8} =$ $\frac{476 \text{ yds., } 3 \text{ qrs., } 2 \text{ nls.}}{8} =$ 59 yds., 2 qrs., 1$\frac{3}{4}$ nls.

(9) $\frac{3}{11}$ of £26 8s. 11d. $= \frac{(\pounds 26 \ 8\text{s. } 11\text{d.}) \times 3}{11} =$ $\frac{\pounds 79 \ 6\text{s. } 9\text{d.}}{11} =$ £7 4s. 3d.

(10) $\frac{6}{7}$ of 128 lbs., 2 sc. $= \frac{(128 \text{ lbs., } 2 \text{ sc.}) \times 6}{7} =$ $\frac{768 \text{ lbs., } 4 \text{ drs.}}{7} =$ 109 lbs., 8 oz., 5 drs. 8$\frac{4}{7}$ grs.

(11) $\frac{7}{8}$ of $\frac{3}{5}$ of $10\frac{2}{3}$ hrs. $= \frac{28}{5}$ hrs. $= 5\frac{3}{5}$ hrs.; $\frac{3}{5}$ hrs. = 36 min.; ∴ value is 5 hrs., 36 min.

(12) $\frac{3}{5}$ lbs. $= 9\frac{3}{5}$ oz.; $\frac{3}{5}$ oz. $= 9\frac{3}{5}$ drs.; 7 lbs., 9 oz., $9\frac{3}{5}$ drs.

(13) $\frac{6}{7}$ of $\frac{2}{3}$ of \$42 $= \frac{4}{7}$ of \$42 = \$24.

(14) $\frac{3}{10}$ dy. $= 7\frac{1}{5}$ hrs.; $\frac{1}{5}$ hr. = 12 min.; 7 hrs. 12 min.

(15) $\frac{9}{16}$ of 24 cds. $= 13\frac{1}{2}$ cds.; $\frac{1}{2}$ cd. = 64 c. ft.; ∴ value is 13 cds., 64 c. ft.

Ex L. (p. 88.)

(1) 3s. 4d. = 40d., £1 = 240d.; ∴ fractⁿ. $= \frac{40}{240} = \frac{1}{6}$.

(2) 2 r., 13 per. = 93 per., 3 ac. = 480 per.; ∴ fractⁿ. $= \frac{93}{480} = \frac{31}{160}$.

(3) 3 wks., 16 min. = 30256 min., ½hr. = 30 min.; ∴ fractⁿ. $= \frac{30256}{30} = \frac{15128}{15}$.

(4) 1 lb., 1 oz., 3 dwts. = 263 dwts., 2 lbs. = 480 dwts.; ∴ fractⁿ. $= \frac{263}{480}$.

(5) 1 lb., 5 oz. = 408 sc., 2 lbs., 1 sc. = 577 sc.; ∴ fractⁿ. $= \frac{408}{577}$.

(6) 8 ac., 3 r. = 1400 per., 2 ac., 32 per. = 352 per.;

$$\therefore \text{fract}^{\text{n}}. = \frac{1400}{352} = \frac{175}{44}.$$

(7) 4 yds., 2 ft., 120 in. = 3000 in., 3 per., $13\frac{1}{4}$ yds., 1 ft., 72 in. = 135000 in.; $\therefore \text{fract}^{\text{n}}. = \frac{3000}{135000} = \frac{1}{45}.$

(8) £1 18s. = 38s., £7 = 140s.; $\therefore \text{fract}^{\text{n}}. = \frac{38}{140} = \frac{19}{70}.$

(9) 2 bu., 1 pk. = 18 gals., 4 bu., 1 gal. = 33 gals.;

$$\therefore \text{fract}^{\text{n}}. = \frac{18}{33} = \frac{6}{11}.$$

(10) \$209, \$5643; $\therefore \text{fract}^{\text{n}}. = \frac{209}{5643} = \frac{6}{11}.$

(11) 2 yds., 2 ft. = 96 in., 13 per., 3 yds., 6 in. = 2688 in.;

$$\therefore \text{fract}^{\text{n}}. = \frac{96}{2688} = \frac{1}{28}.$$

(12) 1 lb. Troy, = 5760 grs., 1 lb. avoir. = 7000 grs.;

$$\therefore \text{fract}^{\text{n}}. = \frac{5760}{7000} = \frac{144}{175}.$$

(13) 3 qts., 7 bu. = 224 qts.; $\therefore \text{fract}^{\text{n}}. = \frac{3}{224}.$

(14) $1\frac{1}{2}$ yds. = 54 in., 4 mls., 2 fur. = 269280 in.;

$$\therefore \text{fract}^{\text{n}}. = \frac{54}{269280} = \frac{3}{14960}.$$

(15) 1 yd. 4 in. = 1300 in., 5 ac., 11 per. = 31402404 in.;

$$\therefore \text{fract}^{\text{n}}. = \frac{1300}{31402404} = \frac{325}{7850601}.$$

Ex. LI. (p. 89.)

(1) $$\frac{\frac{2}{7}\text{ of }\$14}{\frac{1}{2}\text{ of }\$16}=\frac{2}{7}\times\frac{14}{1}\times\frac{2}{1}\times\frac{1}{16}=\frac{1}{2}.$$

(2) $$\frac{\frac{3}{5}\text{ of 2 ac., 2 ro.}}{\frac{1}{9}\text{ of 3 ac., 2 per.}}=\frac{\frac{3}{5}\text{ of 400 per.}}{\frac{1}{9}\text{ of 482 per.}}=\frac{3}{5}\times\frac{400}{1}\times\frac{9}{1}\times\frac{1}{482}$$
$$=\frac{1080}{241}.$$

(3) $$\frac{2\frac{1}{2}\text{ of 3 lbs., 6 dwt.}}{1\frac{1}{3}\text{ of 6 lbs., 12 grs.}}=\frac{\frac{5}{2}\text{ of 17424 grs.}}{\frac{4}{3}\text{ of 34572 grs.}}=\frac{5}{2}\times\frac{17424}{1}$$
$$\times\frac{3}{4}\times\frac{1}{34572}=\frac{5445}{5762}.$$

(4) $$\frac{12\frac{3}{4}\text{ of 3s. 6d.}}{\pounds 1}=\frac{\frac{51}{4}\text{ of 42d.}}{240\text{d.}}=\frac{51}{4}\times\frac{42}{1}\times\frac{1}{240}=\frac{357}{160}.$$

(5) $$\frac{3\frac{1}{3}\text{ of 10 cwt., 2 qrs.}}{1\text{ Ton.}}=\frac{\frac{10}{3}\text{ of 42 qrs.}}{80\text{ qrs.}}=\frac{10}{3}\times\frac{42}{1}\times\frac{1}{80}=\frac{7}{4}.$$

(6) $$\frac{3\frac{1}{2}\text{ of 2 ac., 3 ro.}}{2\text{ ro., }2\frac{1}{2}\text{ per.}}=\frac{\frac{7}{2}\text{ of 880 hf. per.}}{165\text{ hf. per.}}=\frac{7}{2}\times\frac{880}{1}\times$$
$$\frac{1}{165}=\frac{56}{3}.$$

(7) $$\frac{\frac{5}{8}\text{ of 1 lb. Troy}}{1\text{ lb. Avoir.}}=\frac{\frac{5}{8}\text{ of 5760 grs.}}{7000\text{ grs.}}=\frac{5}{8}\times\frac{5760}{1}\times\frac{1}{7000}=\frac{18}{35}.$$

(8) $$1\frac{3}{17}\text{ of }\frac{\pounds 2\ \ 4\text{s. }7\frac{1}{2}\text{d.}}{2\text{s.}}=\frac{\frac{20}{17}\text{ of 1071 half-pence}}{120\text{ half-pence}}=\frac{20}{17}\times$$
$$\frac{1071}{1}\times\frac{1}{120}=\frac{21}{2}.$$

(9) $$\frac{\frac{3}{11}\text{ of }2\frac{3}{4}\text{ mls.}}{\frac{1}{2}\text{ of }\frac{7}{9}\text{ mls.}}=\frac{\frac{3}{11}\text{ of }\frac{11}{4}\text{ mls.}}{\frac{1}{2}\text{ of }\frac{7}{9}\text{ mls.}}=\frac{3}{11}\times\frac{11}{4}\times\frac{2}{1}\times\frac{9}{7}=\frac{27}{14}.$$

(10) $$\frac{6\frac{1}{2}\text{ of 3 cords}}{5\text{ cord ft.}}=\frac{\frac{13}{2}\text{ of 24 cd. ft.}}{5\text{ cd. ft.}}=\frac{13}{2}\times\frac{24}{1}\times\frac{1}{5}=\frac{156}{5}.$$

(11) $$\frac{8\frac{1}{3}\text{ of }6\text{ lbs., }2\text{ sc.}}{1\text{ lb.}}=\frac{\frac{25}{3}\text{ of }1730\text{ sc.}}{288\text{ sc.}}=\frac{25}{3}\times\frac{1730}{1}\times\frac{1}{288}=\frac{21625}{432}.$$

(12) $$\frac{\frac{4}{7}\text{ of }\frac{2}{3}\text{ of }\$21}{\$7}=\frac{4}{7}\times\frac{2}{3}\times\frac{21}{1}\times\frac{1}{7}=\frac{8}{7}.$$

(13) $$\frac{\frac{9}{16}\text{ of }8\text{ yds., }2\text{ nls.}}{2\frac{1}{3}\text{ ells Eng.}}=\frac{\frac{9}{16}\text{ of }130\text{ nls.}}{\frac{140}{3}\text{ nls.}}=\frac{9}{16}\times\frac{130}{1}\times\frac{3}{140}=\frac{351}{224}.$$

(14) $$\frac{2\frac{7}{8}\text{ of }10\text{ hrs.}}{1\text{ dy.}}=\frac{\frac{23}{8}\text{ of }10\text{ hrs.}}{24\text{ hrs.}}=\frac{23}{8}\times\frac{10}{1}\times\frac{1}{24}=\frac{115}{96}.$$

Ex. LII. (p. 92.)

(1) $\frac{3}{4}$ of $\frac{4}{5}=\frac{3}{5}=$ what *A* sells to *C*.
$\frac{1}{12}$ of $\frac{4}{5}=\frac{1}{15}=$ what *A* sells to *B*.
$\frac{4}{5}-(\frac{3}{5}+\frac{1}{15})=\frac{2}{15}=$ *A*'s remaining portion
$\frac{1}{15}+\frac{1}{5}=\frac{4}{15}=$ *B*'s portion.
$\frac{3}{5}=$ *C*'s portion.

(2) (¹) $9\div\frac{3}{8}=24$.
(²) $4\frac{1}{2}+3\frac{9}{10}=8\frac{2}{5}$; $4\frac{1}{2}-3\frac{9}{10}=\frac{3}{5}$; $8\frac{2}{5}-\frac{3}{5}=7\frac{4}{5}$.

(3) Lesser fraction $=(\frac{2}{5}-\frac{3}{8})\div2=\frac{1}{80}$.
Greater fraction $=\frac{2}{5}-\frac{1}{80}$ or $\frac{1}{80}+\frac{3}{8}=\frac{31}{80}$.

(4) (¹) $1\frac{1}{5}$ of $2\frac{2}{5}=\frac{72}{25}$; $3\frac{3}{7}\div\frac{72}{25}=1\frac{4}{21}$.
(²) $\frac{1}{3}$ of $2\frac{1}{7}=\frac{5}{7}$; $3\frac{2}{5}-\frac{5}{7}=1\frac{24}{35}$.

(5) *A* gives *B* $\frac{1}{5}$ of his money; ∴ he has $\frac{4}{5}$ rem'g.
He then gives *C* $\frac{1}{2}$ of $\frac{4}{5}=\frac{2}{5}$ and has rem'g $\frac{4}{5}-\frac{2}{5}=\frac{2}{5}$.
He next gives *D* $\frac{1}{3}$ of $\frac{2}{5}=\frac{2}{15}$ and has rem'g $\frac{2}{5}-\frac{2}{15}=\frac{4}{15}$.
∴ *A* has $\frac{4}{15}$ and *D* has $\frac{2}{15}$; or *A* has twice as much as *D*.

(6) She spends $\frac{1}{3}$ leaving $\frac{2}{3}$; next spends $\frac{3}{4}$ of $\frac{2}{3}=\frac{1}{2}$; hence she has spent $\frac{1}{3}+\frac{1}{2}=\frac{5}{6}$, and has left $\frac{1}{6}$, which by question $=\$4.20$; ∴ her her whole sum was $\$4.20\times6=\$25.20$.

(7) $\frac{3}{11} = \$90$; $\therefore \frac{1}{11} = \$30$; $\therefore$ value of vessel $= \$30 \times 11 = \$330$. $\therefore \frac{1}{3} = \$110$.

(8) 100 cts. $-$ 5 cts. $=$ 95 cts.; $\therefore$ whole income $= \frac{100}{95}$ of $\$855 = \$900$.

(9) $\frac{4}{6} = \frac{2}{3} =$ amount of reduction; hence $\frac{2}{3}$ of $\$54. = \$36$ $=$ amount of reduction.

(10) $\frac{4}{7}$ of a rabbit is worth $\frac{2}{3}$s.; $\therefore \frac{1}{7}$ is worth $\frac{1}{6}$s. $=$ 2d. and a rabbit is worth 2d. $\times 7 =$ 1s. 2d.; $\therefore \frac{3}{5}$ of a rabbit is worth $8\frac{2}{5}$d. $=$ the worth of $\frac{1}{20}$ of a pig; $\therefore$ a pig is worth $20 \times 8\frac{2}{5}$d. $=$ 14s. and 100 pigs are worth $100 \times$ 14s. $=$ £70.

(11) 1 rifleman shoots $\frac{26}{7}$ rounds in 91 minutes, or in 1 minute $\dfrac{26}{7 \times 91} = \dfrac{2}{49}$ of a round; $\therefore$ 37 riflemen in $4\frac{1}{4}$ hrs. (or 255 min.) will shoot $(\frac{2}{49} \times 37 \times 255)$ rounds $= 385\frac{5}{49}$ rounds.

(12) $\frac{3}{8} = \$12.60$; $\therefore \frac{1}{8} = \$4.20$, and whole $= 8 \times \$4.20 = \$33.60$.

(13) 28 sheep eat as much as 15 cows;
$\therefore$ 1 sheep eats as much as $\frac{15}{28}$ cow;
$\therefore$ 20 sheep eat as much as $\frac{15}{28} \times 20 = 10\frac{5}{7}$ cows;
33 cows and 20 sheep $=$ 33 cows $+ 10\frac{5}{7}$ cows $= 43\frac{5}{7}$ cows;
15 cows graze in 11 days 5 ac.;
$\therefore$ 1 cow grazes in 1 day $\dfrac{5}{15 \times 11}$ or $\frac{1}{33}$ ac.;
$\therefore 43\frac{5}{7}$ cows graze in 1 day $\frac{1}{33} \times \frac{306}{7}$, or $\frac{102}{77}$ ac.
$\therefore 43\frac{5}{7}$ cows graze 18 ac. in $18 \div \frac{102}{77}$ days, or $\dfrac{18 \times 77}{102}$
$= 13\frac{10}{17}$ days.

(14) (^{1}) A is to have half as much again as B, $\therefore \$94.50$ must be divided into 5 equal shares of which A is to have 3 and B 2; $\$94.50 \div 5 = \$18.90$; $\$18.90 \times 3 = \$56.70 = A$'s share; $\$18.90 \times 2 = \$37.80 = B$'s share.

(Continued on next page.)

(14 continued.)

(2) B is to have half A's share or A is to have twice B's; $\therefore$ \$94.50 must be divided into 3 equal shares, of which A is to have 2 and B 1. $\$94.50 \div 3 = \$31.50$; $\$31.50 \times 2 = \$63.00 = A$'s share; $\$31.50 \times 1 = \$31.50 = B$'s share.

(15) Amount of debt $= \$500 + (\$250 \times 2) + (\$75 \times 3) = \$1225$; amount of property $= \$625$; $\therefore$ he will pay $\$\frac{625}{1225} = \$\frac{25}{49}$ in the \$ and the first creditor will receive $\$500 \times \frac{25}{49} = \$255.10\frac{10}{49}$.

(16) \$750 would purchase $\frac{750}{10000} = \frac{3}{40}$ of the mine; $\therefore$ $\frac{3}{16}$ of the man's share $= \frac{3}{40}$ of the whole mine; and his entire share $= (\frac{3}{40} \div \frac{3}{16})$ of the mine $= \frac{2}{5}$.

(17) The first and second div^{ns}. contain $\frac{12}{25} + \frac{1}{5} = \frac{17}{25}$ of the entire school, therefore the remaining, or $\frac{8}{25}$ must belong to the third div^{n}., which by the question contains 80. If $80 = \frac{8}{25}$, $\frac{1}{25} = \frac{1}{8}$ of $80 = 10$, and the whole, or $\frac{25}{25} = 25 \times 10 = 250$.

(18) A can do in 1 day $\frac{1}{10}$; B can do in 1 day $\frac{1}{12}$; therefore A and B together do in 1 day $\frac{1}{10} + \frac{1}{12} = \frac{11}{60}$; $\therefore$ no of days in which A and B will together do the

$$\text{work} = \frac{\text{whole work}}{\text{part done in one day}} = \frac{1}{\frac{11}{60}} = 5\tfrac{5}{11} \text{ days.}$$

(19) Eldest son rec'd $\frac{13}{25}$ leaving $\frac{12}{25}$.
Second son rec'd $\frac{13}{25}$ of $\frac{12}{25} = \frac{156}{625}$.
Widow rec'd $1 - (\frac{13}{25} + \frac{156}{625}) = \frac{144}{625}$.
Also by the question $\frac{13}{25} - \frac{156}{625}$ (the eldest son's share minus the second son's) $= \$1690$, or $\frac{169}{625} = \$1690$; $\therefore$ whole property $= \dfrac{\$1690}{\frac{169}{625}} = \$6250$.
Eldest son rec'd $\frac{13}{25}$ of $\$6250 = \$3250$.
Second son rec'd $\frac{156}{625}$ of $6250 = \$1560$.
Widow rec'd $\frac{144}{625}$ of $\$6250 = \$1440$.

(20) Since C receives 9 ac. more than A and B; $\therefore$ 85 ac., 2 ro. $-$ 9 ac. must be equally divided be-

(Continued on next page.)

(20 continued.)

tween A, B, and C; hence A's and B's share $= \dfrac{76 \text{ ac., } 2 \text{ ro.}}{2} = 38$ ac., 1 ro.

If A receives 1, B receives $\frac{6}{11}$, ∴ A's and B's $= 1\frac{6}{11}$.
∴ A's $=$ (38 ac., 1 ro.) $\times \frac{11}{17} = 24$ ac., 3 ro.,
B's $= 13$ ac., 2 ro., C's $= 47$ ac. 1 ro.

(21) 3 boys (one out of each third) paid $(18+30+42)$ cts. $= 90$ cts.; ∴ the average payment made by each boy $= \frac{90}{3}$ cts. $= 30$ cts.; ∴ no. of boys $= \frac{1440}{30} = 48$.

(22) First pipe fills $\frac{1}{6}$ of the cistern per minute; second and third pipes empty $\frac{1}{6} + \frac{1}{7} = \frac{13}{42}$ of the cistern per minute; ∴ part of cistern filled per minute $= \frac{1}{6} - \frac{13}{42} = \frac{1}{42}$. ∴ No. of minutes $= \dfrac{\text{cistern}}{\text{part filled a min.}} = \dfrac{1}{\frac{1}{42}} = 42$.

(23) (1) A and B do in 1 day $\frac{1}{30}$ of the work.
B does in 1 day $\frac{1}{70}$ of the work.
∴ A does in 1 day $\frac{1}{30} - \frac{1}{70} = \frac{2}{105}$ of the work.
∴ A can do the whole in $\dfrac{1}{\frac{2}{105}}$ days $= 52\frac{1}{2}$ days.

(2) A does $\frac{2}{105} - \frac{1}{70} = \frac{1}{210}$ more than B in 1 day.
∴ A does $\frac{1}{210} \times 30 = \frac{1}{7}$ more than B in 30 days.

(24) A and B do $\frac{3}{20}$ of the work in 1 day.
A and C do $\frac{2}{11}$ of the work in 1 day.
∴ 2 A, B, and C do $\frac{3}{20} + \frac{2}{11} = \frac{73}{220}$ of the work in 1 day.
But A, B, and C do $\frac{4}{15}$ of the work in 1 day;
∴ A does $\frac{73}{220} - \frac{4}{15} = \frac{43}{660}$ of the work in 1 day;
∴ no. of days required by $A = \dfrac{\text{whole work}}{\text{part done in 1 day}}$
$= \dfrac{1}{\frac{43}{660}} = 15\frac{15}{43}$.

(25) $\frac{4}{7}$ remains in 1st.; ∴ $\frac{3}{7}$ is put into 2nd., 3d. holds $\frac{3}{7} - (\frac{1}{4}$ of $\frac{3}{7}) = \frac{9}{28}$; and fills $\frac{9}{16}$ of 4th. cask, which con-

(Continued on next page.)

(25 continued.)

sequently holds $\frac{9}{28} \div \frac{9}{16} = \frac{4}{7}$; $\therefore$ 3d. and 4th. together hold $\frac{9}{28} + \frac{4}{7} = \frac{25}{28}$ leaving when taken from first cask $\frac{3}{28}$, which by the question is equivalent to 15 gallons;

$\therefore$ 1st. cask holds $\frac{15}{\frac{3}{28}} = 140$ gallons,
2nd. cask holds $\frac{3}{7}$ of $140 = 60$ gallons,
3rd. cask holds $\frac{9}{28}$ of $140 = 45$ gallons,
4th. cask holds $\frac{4}{7}$ of $140 = 80$ gallons.

(26) While A does $\frac{1}{2}$ the work B does $\frac{1}{3}$;
$\therefore$ while A does the whole work B does $\frac{2}{3}$;
$\therefore$ while A does the whole work A and B do $\frac{5}{3}$.
But A and B do the work in 12 days; $\therefore$ A requires $\frac{5}{3}$ of 12 days $= 20$ days to complete the work alone.

Ex. LIII. (p. 95.)

(1) $\cdot 3 = \frac{3}{10}$; $\cdot 13 = \frac{13}{100}$; $\cdot 19 = \frac{19}{100}$; $\cdot 301 = \frac{301}{1000}$; $\cdot 270 = \frac{270}{1000}$; $\cdot 5653 = \frac{5653}{10000}$.

(2) $\cdot 504 = \frac{504}{1000}$; $\cdot 73201 = \frac{73201}{100000}$; $\cdot 791003 = \frac{791003}{10000000}$; $\cdot 03 = \frac{3}{100}$; $\cdot 0045 = \frac{45}{10000}$.

(3) $\cdot 300 = \frac{300}{1000}$; $18.741 = 18\frac{741}{1000} = \frac{18741}{1000}$; $2\cdot 1 = 2\frac{1}{10} = \frac{21}{10}$; $\cdot 000001 = \frac{1}{10000000}$; $5\cdot 0007 = 5\frac{7}{10000} = \frac{50007}{10000}$.

(4) $347\cdot 02007 = 347\frac{2007}{100000} = \frac{34702007}{100000}$; $500\cdot 005 = 500\frac{5}{1000} = \frac{500005}{1000}$; $5\cdot 60746805 = \frac{560746805}{1000000000}$; $\cdot 0000500$ $\frac{500}{100000000}$.

(5) $29\cdot 0050 = 29\frac{50}{10000} = \frac{290050}{10000}$; $20\cdot 607 = 20\frac{607}{1000} = \frac{20607}{1000}$; $5\cdot 00038 = 5\frac{38}{100000} = \frac{500038}{100000}$.

Ex. LIV. (p. 96.)

(1) $\frac{4}{10} = \cdot 4$; $\frac{23}{10} = 2\cdot 3$; $\frac{235}{10} = 23\cdot 5$; $\frac{4}{100} = \cdot 04$; $\frac{147}{1000} = \cdot 147$; $\frac{47}{1000} = \cdot 047$.

(2) $\frac{5001}{10} = 500\cdot 1$; $\frac{951}{100000} = \cdot 00951$; $\frac{502}{100} = 5\cdot 02$; $\frac{502}{100000} = \cdot 00502$.

(3) $\frac{35600}{1000}$ = 35·6; $\frac{1700701}{100000}$ = 17·00701; $\frac{50005}{10000000}$ = ·0050005; $\frac{2}{10000000}$ = ·0000002; $\frac{2076854}{100000}$ = 20·76854; $\frac{53052}{10000000000}$ = ·0000053052.

(4) Seven tenths = ·7; thirty thousandths = ·030.

(5) Three hundred and three thousandths = 300·003; one ten thousandth = ·0001.

(6) Four, and five hundred and four millionths = 4·000504; seventy ten millionths = ·0000070.

(7) ·6 = six tenths; ·17 = seventeen hundredths; ·07 = seven hundredths.

(8) ·007 = seven thousandths; ·700 = seven hundred thousandths or seven tenths; 6·3004 = six and three thousand and four ten thousandths.

(9) 35·00205 = thirty-five and two hundred and five hundred thousandths; 400·34000 = four hundred, and thirty-four thousand one hundred thousandths, or four hundred and thirty-four hundredths.

(10) ·3 × 10 = 3; ·3 × 100 = 30; ·3 × 10000 = 3000; ·3 × 10000000 = 3000000; ·13 × 10 = 1·3; ·13 × 100 = 13; ·13 × 10000 = 1300; ·13 × 10000000 = 1300000; ·013 × 10 = ·13; ·013 × 100 = 1·3; ·013 × 10000 = 130; ·013 × 10000000 = 130000; 54·0003 × 10 = 540·003; 54·0003 × 100 = 5400·03; 54·0003 × 10000 = 540003; 54·0003 × 10000000 = 540003000; 7420·1 × 10 = 74201; 7420·1 × 100 = 742010; 7420·1 × 10000 = 74201000; 7420·1 × 10000000 = 74201000000.

(11) $\frac{5\cdotp362}{10}$ = ·5362; $\frac{5\cdotp362}{100}$ = ·05362; $\frac{5\cdotp362}{1000000}$ = ·000005362; $\frac{\cdotp3}{10}$ = ·03; $\frac{\cdotp3}{100}$ = ·003; $\frac{\cdotp3}{1000000}$ =

(Continued on next page.)

(11 continued.)

$$\cdot0000003\,;\ \frac{70{\cdot}0107}{10} = 7{\cdot}00107\cdot\ \frac{70{\cdot}0107}{100} = \cdot700107\,;$$

$$\frac{70.0107}{1000000} = \cdot0000700107\,;\ \frac{5000}{10} = 500\,;\ \frac{5000}{100} = 50\,;$$

$$\frac{5000}{1000000} = \cdot005.$$

$$(12)\ \frac{2{\cdot}03}{1000000} = \cdot00000203.$$

Ex. LV. (p. 97.)

(1)

$$\begin{array}{r} 1{\cdot}035 \\ \cdot00643 \\ 27{\cdot} \\ 2{\cdot}2146 \\ 530{\cdot}09 \\ \hline 560{\cdot}34603 \end{array}$$

(2)

$$\begin{array}{r} 24{\cdot} \\ 185{\cdot}3000 \\ \cdot98795 \\ 3{\cdot}098 \\ \cdot70006 \\ \hline 214{\cdot}08691 \end{array}$$

(3)

$$\begin{array}{r} 186{\cdot}8 \\ 35{\cdot}2779 \\ 9000{\cdot} \\ 9{\cdot}201 \\ 830{\cdot}05764 \\ \hline 10061{\cdot}33654 \end{array}$$

(4)

$$\begin{array}{r} 94{\cdot}25 \\ \cdot008 \\ 187{\cdot}96009 \\ 57{\cdot}3916 \\ 5{\cdot}998347 \\ \hline 345{\cdot}608037 \end{array}$$

(5)

$$\begin{array}{r} 12{\cdot}5 \\ 20{\cdot}043 \\ 7{\cdot}63201 \\ \cdot0561 \\ \hline 40{\cdot}23111 \end{array}$$

Again

$$12{\cdot}5 = 12\tfrac{5}{10} = 12\tfrac{1}{2}$$

$$20{\cdot}043 = 20\tfrac{43}{1000}$$

$$7{\cdot}63201 = 7\tfrac{63201}{100000}$$

$$\cdot0561 = \tfrac{561}{10000}$$

$$12\frac{1}{2} + 20\frac{43}{1000} + 7\frac{63201}{100000} + \frac{561}{10000} = 39 +$$

$$\frac{50000 + 4300 + 63201 + 5610}{100000} = 39 + \frac{123111}{100000} = 40\frac{23111}{100000}$$

$$= 40{\cdot}23111.$$

(6)

·0573
15·
2·04
567·98075
585·07805

$.0573=\frac{573}{10000}$.

$2·04=2\frac{4}{100}$

$567·98075=567\frac{98075}{100000}$.

$$\frac{573}{10000}+15+2\frac{4}{100}+567\frac{98075}{100000}=584+$$

$$\frac{5730+4000+98075}{100000}=584\frac{107805}{100000}=585\frac{7805}{100000}=585·07805$$

(7)

505·0003
13·98
5853·097
960·
7332·0773

$505·0003=505\frac{3}{10000}$

$13·98=13\frac{98}{100}$

$5353·097=5853\frac{97}{1000}$

$$505\frac{3}{10000}+13\frac{93}{100}+5853\frac{97}{1000}+960=$$

$$7331+\frac{3+9800+970}{10000}=7331\frac{10773}{10000}=7332\frac{773}{10000}$$

$$=7332·0773.$$

(8)

6·00734
54·
15·70087012
8·00003
9·987789
93·69602912

$6·00734=6\frac{734}{100000}$

$15·70087012=15\frac{70087012}{100000000}$

$8·00003=8\frac{3}{100000}$

$9·987789=9\frac{987789}{1000000}$

$$6\frac{734}{100000}+54+15\frac{70087012}{100000000}+8\frac{3}{100000}+9\frac{987789}{1000000}=$$

$$92+\frac{734000+70087012+3000+98778900}{100000000}=92\frac{169602912}{100000000}$$

$$=93\frac{69602912}{100000000}=93·69602912.$$

(9)

$$\begin{array}{r} \cdot13\\ 7\cdot0003\\ 408\cdot5\\ 978\cdot\\ \cdot0808\\ \hline 1393\cdot7111 \end{array} \qquad \begin{array}{r} \cdot13=\tfrac{13}{100}\\ 7\cdot0003=7\tfrac{3}{10000}\\ 408\cdot5=408\tfrac{5}{10}\\ \\ \cdot0808=\tfrac{808}{10000} \end{array}$$

$$\frac{13}{100}+7\frac{3}{10000}+408\frac{5}{10}+\frac{808}{10000}+978=1393+\frac{1300+3+5000+808}{10000}=1393\frac{7111}{10000}=1393\cdot7111.$$

Ex. LVI. (p. 98.)

$$\begin{array}{r} (1)\\ 5\cdot345\\ 3\cdot087\\ \hline 2\cdot258 \end{array} \qquad \begin{array}{r} (2)\\ 26\cdot002\\ 18\cdot9564\\ \hline 7\cdot0456 \end{array} \qquad \begin{array}{r} (3)\\ 15\cdot67\\ 9\cdot7003\\ \hline 5\cdot9697 \end{array} \qquad \begin{array}{r} (4)\\ 21\cdot\\ 19\cdot9009\\ \hline 1\cdot0991 \end{array}$$

(1) $$\begin{array}{r} 1\cdot3\\ \cdot13\\ \hline 1\cdot17 \end{array} \qquad \begin{array}{l} 1\cdot3=1\tfrac{3}{10}\\ \cdot13=\tfrac{13}{100} \end{array}$$

(5) $$\begin{array}{r} 207\cdot\\ 2\cdot07\\ \hline 204\cdot93 \end{array} \qquad 2\cdot07=2\tfrac{7}{100}$$

$1\tfrac{3}{10}-\tfrac{13}{100}=\tfrac{117}{100}=1\cdot17$; $207-2\tfrac{7}{100}=204\tfrac{93}{100}=204\cdot93$.

(2) $$\begin{array}{r} 76\cdot3\\ 7\cdot63\\ \hline 68\cdot67 \end{array} \qquad \begin{array}{l} 76\cdot3=76\tfrac{3}{10}\\ 7\cdot63=7\tfrac{63}{100} \end{array} \qquad \begin{array}{r} 67\cdot5803\\ 67\cdot3\\ \hline \cdot2803 \end{array} \qquad \begin{array}{l} 67\cdot5803=67\tfrac{5803}{10000}\\ 67\cdot3=67\tfrac{3}{10} \end{array}$$

$76\tfrac{3}{10}-7\tfrac{63}{100}=68\tfrac{67}{100}=68\cdot67$;

$67\tfrac{5803}{10000}-67\tfrac{3}{10}=\tfrac{2803}{10000}=\cdot2803$;

(3) $$\begin{array}{r} 501\cdot\\ 428\cdot90456\\ \hline 72\cdot09544 \end{array} \qquad 428\cdot90456=428\tfrac{90456}{100000}$$

$501-428\tfrac{90456}{100000}=72\tfrac{09544}{100000}=72\cdot09544$;

(Continued on next page.)

(5 Continued.)

5324·
53·24
5270·76

$53·24=53\frac{24}{100}$

$5324-53\frac{24}{100}=5270\frac{76}{100}=5270·76$;

(4) 4·42
·00043
4·41958

$4·42=4\frac{42}{100}$

$·00042=\frac{42}{100000}$

$4\frac{42}{100}-\frac{42}{100000}=4\frac{41958}{100000}=4·41958$

·007
·0000007
·0069993

$·007=\frac{7}{1000}$

$·0000007=\frac{7}{10000000}$

$\frac{7}{1000}-\frac{7}{10000000}=\frac{69993}{10000000}=·0069993.$

(6)

(1) 2·3
·23
2·07

(2) 23·
2·07
20·93

(7)

(1) ·1
·005
·095

(2) 20·009
·029
19·980

(8)

·7
·087
·613

1·2
·12
·012
210·
211·332

(9)

$·332=\frac{332}{1000}$, $1-\frac{332}{1000}=\frac{668}{1000}=\frac{167}{250}$.

(10)

(1) 31·25
3·059
28·191
235·6758
263·8668
184·0003
79·8665

(2) 215·263
6·9504
208·3126
125·3807
82·9319

7·0004
·05
6·9504

45·08
80·3007
125·3807

Ex. LVII. (p. 98.)

(1)

$$\begin{array}{r} 3{\cdot}25 \\ {\cdot}35 \\ \hline 1625 \\ 975 \\ \hline 1{\cdot}1375 \end{array}$$

(2)

$$\begin{array}{r} 6{\cdot}035 \\ 2{\cdot}7 \\ \hline 42245 \\ 12070 \\ \hline 16{\cdot}2945 \end{array}$$

(3)

$$\begin{array}{r} 40{\cdot}004 \\ 2{\cdot}03 \\ \hline 120012 \\ 80008 \\ \hline 81{\cdot}20812 \end{array}$$

(4)

$$\begin{array}{r} 680{\cdot}35 \\ {\cdot}0049 \\ \hline 612315 \\ 272140 \\ \hline 3{\cdot}333715 \end{array}$$

(5)

$$\begin{array}{r} 20607 \\ {\cdot}20607 \\ \hline 144249 \\ 123642 \\ 41214 \\ \hline 4246{\cdot}48449 \end{array}$$

(6)

$$\begin{array}{r} 60{\cdot}70 \\ 11 \\ \hline 667{\cdot}81, \end{array}$$

$60{\cdot}71 = 60\frac{71}{100}$

$\frac{60{\cdot}71}{100} \times 11 = \frac{66781}{100} = 667{\cdot}81;$

$$\begin{array}{r} 57{\cdot}068 \\ 2{\cdot}004 \\ \hline 228272 \\ 114136 \\ \hline 114{\cdot}364272, \end{array}$$

$57{\cdot}068 \times 2{\cdot}004 = \frac{567068}{1000} \times \frac{2004}{1000} = \frac{114369472}{10000000} = 114{\cdot}364272;$

$$\begin{array}{r} 5{\cdot}36 \\ 700 \\ \hline 3752{\cdot}00, \end{array}$$

$5{\cdot}36 \times 700 = \frac{536}{100} \times \frac{700}{1} = 3752;$

$$\begin{array}{r} 7{\cdot}01509 \\ 50{\cdot}805 \\ \hline 3507545 \\ 5612072 \\ 3507545 \\ \hline 356{\cdot}40164745 \end{array}$$

$7{\cdot}01509 \times 50{\cdot}805 = \frac{701509}{100000} \times \frac{50805}{1000} = \frac{35640164745}{100000000} = 356{\cdot}40164745.$

(7)

$$\begin{array}{r} 48{\cdot}067\\ {\cdot}00037\\ \hline 336469\\ 144201\\ \hline {\cdot}01778479, \end{array}$$

$48{\cdot}067 \times {\cdot}00037 = \frac{48067}{1000} \times \frac{37}{100000} = \frac{1778479}{100000000} = {\cdot}01778479$;

$$\begin{array}{r} 54{\cdot}3047\\ 9{\cdot}00005\\ \hline 2715235\\ 4887423\\ \hline 488{\cdot}745015235, \end{array}$$

$54{\cdot}3047 \times 9{\cdot}00005 = \frac{543047}{10000} \times \frac{900005}{100000} = \frac{488745015235}{1000000000} = 488{\cdot}745015235$;

$$\begin{array}{r} 2{\cdot}568\\ {\cdot}00025\\ \hline 12840\\ 5136\\ \hline {\cdot}00064200 = {\cdot}000642 \end{array}$$

$2{\cdot}568 \times {\cdot}00025 = \frac{2568}{1000} \times \frac{25}{100000} = \frac{64200}{100000000} = {\cdot}000642.$

(8)

(1)

$$\begin{array}{r} 5{\cdot}5\\ {\cdot}055\\ \hline 275\\ 275\\ \hline {\cdot}3025\\ 550\\ \hline 151250\\ 15125\\ \hline 166{\cdot}3750\\ {\cdot}0055\\ \hline 831875\\ 831875\\ \hline {\cdot}9150625, \end{array}$$

$5{\cdot}5 \times {\cdot}055 \times 550 \times {\cdot}0055 = \frac{55}{10} \times \frac{55}{1000} \times \frac{550}{1} \times \frac{55}{10000} = \frac{9150625}{10000000} = {\cdot}9150625$;

(Continued on next page.)

(8 continued.)

(2)

$1{\cdot}75 \times 6{\cdot}2 \times 85 \times {\cdot}0004 = \frac{175}{100} \times \frac{62}{10} \times \frac{85}{1} \times \frac{4}{10000} = \frac{3689}{10000} = {\cdot}3689.$

```
  1·75
   6·2
 ------
   350
 1050
 ------
 10·850
     85
 ------
   5425
 8680
 ------
 922·25
  ·0004
 ------
·368900 = ·3689.
```

(9)

```
   37·85
    7·35
  ------
   18925
  11355
 26495
 --------
 278·1975 yds.
```

(10)

```
   365
   ·95
  -----
  1825
 3285
 ------
 346·75 =
 346¾ loaves.
```

Ex. LVIII. (p. 100.)

(1)

```
2·7) 33·372 (12·36
     27
     --
      63
      54
      --
       97
       81
       --
       162
       162
       ---
```

$33{\cdot}372 \div 2{\cdot}7 = \frac{33372}{1000} \times \frac{10}{27} = \frac{1236}{100} = 12{\cdot}36.$

(2)

·27) ·33372 (1·236

$\cdot 33372 \div {\cdot}27 = \frac{33372}{100000} \times \frac{100}{27} = \frac{1236}{1000} = 1{\cdot}236.$

(3)

27) ·33372 (·01236

$\cdot 33372 \div 27 = \frac{33372}{100000} \times \frac{1}{27} = \frac{1236}{100000} = {\cdot}01236.$

(4)

·27) 33372·00 (123600

$33372 \div {\cdot}27 = \frac{33372}{1} \times \frac{100}{27} = \frac{3337200}{27} = 123600.$

(5)

·00027) 33372·00000 (123600000 $\quad 33372 \div {\cdot}00027 = \frac{33372}{1} \times \frac{100000}{27} = 123600000.$

(6)

·323) 561·0833 (1737·1
323
2380
2261
1198
969
2293
2261
323
323

$561{\cdot}0833 \div {\cdot}323 = \frac{5610833}{10000} \times \frac{1000}{323} = \frac{17371}{10} = 1737{\cdot}1.$

(7)

·323) 5610833·000 (17371000 $\quad 5610833 \div {\cdot}323 = \frac{5610833}{100} = \frac{1000}{323} = 17371000.$

(8)

3·23) 56108·33 (17371 $\quad 56108{\cdot}33 \div 3{\cdot}23 = \frac{5610833}{100} \times \frac{100}{323} = \frac{561083}{323} = 17371.$

(9)

·0000323) 5610·8330000 (173710000 $\quad 5610{\cdot}833 \div {\cdot}0000323 = \frac{5610833}{1000} \times \frac{10000000}{323} = 173710000.$

(10)

3·25) 552·5325 (170·01
325
2275
2275
325
325

$552{\cdot}5325 \div 3{\cdot}25 = \frac{5525325}{10000} \times \frac{100}{325} = \frac{17001}{100}$]
170·01;

(10 continued.)

·00325) 552·53250 (170010,

552·5325 ÷ ·00325 = $\frac{5525325}{10000} \times \frac{100000}{325} = 170010.$

(11)

464·3) 2·419003 (·00521
23215

9750
9286

4643
4643

2·419003 ÷ 464·3 = $\frac{2419003}{1000000} \times \frac{10}{4643} = \frac{521}{100000} =$ ·00521;

·004643) 2·419003 (521

2·419003 ÷ ·004643 = $\frac{2419003}{1000000} \times \frac{1000000}{4643} = 521.$

(12)

2·7) ·000081 (·00003
81

·000081 ÷ 2·7 = $\frac{81}{1000000} \times \frac{10}{27} = \frac{3}{100000} =$ ·00003;

·0027) ·000081 (·03

·00081 ÷ ·0027 = $\frac{81}{1000000} \times \frac{10000}{27} = \frac{3}{100} =$ ·03;

27000) ·000081 (·000000003,

·000081 ÷ 27000 = $\frac{81}{1000000}$ $\frac{1}{27000} = \frac{3}{1000000000} =$ ·000000003.

(13)

2·00099) 218051·081884 (108971·6
200099

1795208
1600792

1944161
1800191

1432708
1400693

320153
200099

1200594
1200594

218051·081884 ÷ 2·00099 = $\frac{218051081884}{1000000} \times \frac{100000}{200099} = \frac{1089716}{10} =$ 108971·6;

200099) 218051·081884 (1·089716

218051·081884 ÷ 200099 = $\frac{218051081884}{1000000} \times \frac{1}{200099} = \frac{1089716}{1000000} =$ 1·089716.

(14)

11) ·121 (·011
121

$·121 \div 11 = \frac{121}{1000} \times \frac{1}{11} = ·011$;

1100) ·12100 (·00011

$·121 \div 1100 = \frac{121}{1000} \times \frac{1}{1100} = \frac{11}{100000} = ·00011$;

·0011) ·1210000 (110

$·121 \div ·0011 = \frac{121}{1000} \times \frac{10000}{11} = 110.$

(15)

·000193) 393·720000 (2040000
386

772
772

$393·72 \div ·000193 = \frac{39372}{100} \times \frac{1000000}{193} = 2040000$;

1·93) 393·72 (204
393·72

$393·72 \div 1·93 = \frac{39372}{100} \times \frac{100}{193} = 204$;

193000) 393·72000 (·00204
39372000

$393·72 \div 193000 = \frac{39372}{100} \times \frac{1}{193000} = \frac{204}{1000000} = ·00204.$

(16)

·03275) 590·48250 (18030
3275

26298
26200

9825
9825

$590·4825 \div ·03275 = \frac{5904825}{10000} \times \frac{100000}{3275} = 18030$;

327500) 590·4825000 (·0018030

$590·4825 \div 327500 = \frac{590482}{10000} \times \frac{1}{327500} = \frac{1803}{1000000} = ·001803.$

(17)

```
1·00103) 213·419596 (213·2
         200206
         ------
          132135
          100103
          ------
           320329
           300309
           ------
            200206
            200206
            ------
```

213·419596 ÷ 1·00103 $= \frac{213419596}{1000000} \times \frac{1000000}{100103} = \frac{2132}{10} =$ 213·2;

```
100103) 213·419596 (·002132
```

213·419596 ÷ 100103 $= \frac{213419596}{1000000} \times \frac{1}{100103} = \frac{2132}{1020000} =$ ·002132.

(18)

```
  ·0024
  ·24
  -----
·24) ·2424 (·0101
     24
     ---
       24
       24
       --
```

(19)

```
·25) ·000200 (·0008
        200
        ---
```

(20)

```
1·75) 21·875 (12·5 days,
      175        or 12½ days.
      ---
       437
       350
       ---
        875
        875
        ---
```

(21)

```
·75) 64·125 (85·5 times,
     600          or 85½ times.
     ---
      412
      375
      ---
       375
       375
       ---
```

(22)

```
·023) ·00070242 (·03054
       69
       ---
        124
        115
        ---
          92
          92
          --
```

Ex. LIX. (p. 101.)

(1)

·3)1·9000(6·333
18
10
9
10

$$1{\cdot}9 \div {\cdot}3 = \tfrac{19}{10} \times \tfrac{10}{3} = \tfrac{19}{3} \times \tfrac{10}{10} = \tfrac{1900}{3} \times \tfrac{1}{1000} = \tfrac{6333}{1000} = 6{\cdot}333;$$

·03)1·90000(63·333

$$1{\cdot}9 \div {\cdot}03 = \tfrac{19}{10} \times \tfrac{100}{3} = \tfrac{19}{3} \times \tfrac{100}{10} = \tfrac{190000}{3} \times \tfrac{1}{1000} = \tfrac{63333}{1000} = 63{\cdot}333;$$

300)1·900(·00633

$$1{\cdot}9 \div 300 = \tfrac{19}{10} \times \tfrac{1}{300} = \tfrac{19}{300} \times \tfrac{1}{10} = \tfrac{1900}{300} \times \tfrac{1}{1000} = \tfrac{633}{100000} = {\cdot}00633, \text{ or } {\cdot}006.$$

(2)

159)4·937(·031
577
167
159

$$4{\cdot}936 \div 159 = \tfrac{4937}{1000} \times \tfrac{1}{159} = \tfrac{4937}{159} \times \tfrac{1}{1000} = \tfrac{31}{1000} = {\cdot}031;$$

1·59)4·93700(3·105
477
167
159
800
795

$$4{\cdot}937 \div 1{\cdot}59 = \tfrac{4937}{1000} \times \tfrac{100}{159} = \tfrac{4937}{159} \times \tfrac{100}{1000} = \tfrac{493700}{159} \times \tfrac{1}{1000} = \tfrac{3105}{1000} = 3{\cdot}105;$$

1590)4·937(·003

$$4{\cdot}937 \div 1590 = \tfrac{4937}{1000} \times \tfrac{1}{1590} = \tfrac{4937}{1590} \times \tfrac{1}{1000} = \tfrac{3}{1000} = {\cdot}003.$$

(3)

$$\begin{array}{l} 53)\,329744{\cdot}000\,(6221{\cdot}584 \\ \quad 318 \\ \hline \quad\; 117 \\ \quad\; 106 \\ \hline \quad\;\; 114 \\ \quad\;\; 106 \\ \hline \quad\;\;\; 84 \\ \quad\;\;\; 53 \\ \hline \quad\;\;\; 310 \end{array} \qquad 3{\cdot}29744 \div 53 = \tfrac{329744000}{1} \times \tfrac{1}{53000} = \tfrac{6221584}{1000} = 6221{\cdot}584;$$

$$\begin{array}{l} 310 \\ 265 \\ \hline \;\; 450 \\ \;\; 424 \\ \hline \;\;\; 260 \\ \;\;\; 212 \end{array}$$

$${\cdot}0053)\,329744{\cdot}0000000\,(62215849{\cdot}056,$$
$$329744 \div {\cdot}0053 = 3297440000000 \times \tfrac{1}{5300} = \tfrac{62215849056}{1000}$$
$$= 62215849{\cdot}056;$$

$$5300)\,329744\,(62{\cdot}215, \quad 329744 \div 5300 = \tfrac{3297440}{1} \times \tfrac{1}{53000}$$
$$= \tfrac{62215}{1000} = 62{\cdot}215.$$

Ex. LX. (p. 102.)

(1)

$$\begin{array}{r|l} 4 & 1{\cdot}00 \\ \hline & {\cdot}25 \end{array}; \quad \begin{array}{r|l} 5 & 3{\cdot}0 \\ \hline & {\cdot}6 \end{array}; \quad \begin{array}{r|l} 4 & 6{\cdot}0 \\ \hline & 1{\cdot}5 \end{array}; \quad \begin{array}{r|l} 5 & 1{\cdot}0 \\ \hline & {\cdot}2 \end{array} \quad \therefore \text{ Ans.} = 6{\cdot}2; \quad \begin{array}{r|l} 5 & 39{\cdot}0 \\ \hline & 7{\cdot}8 \end{array}$$

$$\begin{array}{r|l} 8 & 5{\cdot}000 \\ \hline & {\cdot}625 \end{array}; \quad \begin{array}{r|l} 10 & 3{\cdot}0 \\ \hline & {\cdot}3 \end{array} \quad \therefore \text{ Ans.} = 5{\cdot}3.$$

(2)

$$16\begin{cases} 4 \\ 4 \end{cases}\begin{array}{|r} 3{\cdot}00 \\ \hline {\cdot}7500 \\ \hline {\cdot}1875 \end{array}; \qquad 16\begin{cases} 4 \\ 4 \end{cases}\begin{array}{|r} 15{\cdot}00 \\ \hline 3{\cdot}7500 \\ \hline {\cdot}9375 \end{array}; \quad \therefore \text{ Ans.} = 8{\cdot}9375;$$

$$20\begin{cases} 5 \\ 4 \end{cases}\begin{array}{|r} 19{\cdot}0 \\ \hline 3{\cdot}80 \\ \hline {\cdot}95 \end{array}; \quad 32\begin{cases} 4 \\ 8 \end{cases}\begin{array}{|r} 31{\cdot}00 \\ \hline 7{\cdot}75000 \\ \hline .96875 \end{array}; \quad 40\begin{cases} 8 \\ 5 \end{cases}\begin{array}{|r} 37{\cdot}000 \\ \hline 4{\cdot}625 \\ \hline {\cdot}925 \end{array}$$

$$\because \text{ Ans.} = 7.925.$$

(3)

$$50\left\{\begin{array}{r|l}5 & 47{\cdot}0\\ \cline{2-2} 10 & \;\;9{\cdot}40\\ \cline{2-2} & \;\;\;{\cdot}94\end{array}\right.; \qquad 125\left\{\begin{array}{r|l}5 & 7{\cdot}0\\ \cline{2-2} 5 & 1{\cdot}40\\ \cline{2-2} 5 & \;{\cdot}280\\ \cline{2-2} & \;{\cdot}056\end{array}\right. \qquad \therefore \text{Ans.} = 4{\cdot}056;$$

$$500\left\{\begin{array}{r|l}10 & 3{\cdot}0\\ \cline{2-2} 10 & \;{\cdot}30\\ \cline{2-2} 5 & \;{\cdot}030\\ \cline{2-2} & \;{\cdot}006\end{array}\right.; \qquad 625\left\{\begin{array}{r|l}5 & 99{\cdot}00\\ \cline{2-2} 5 & 19{\cdot}80\\ \cline{2-2} 5 & \;\;3{\cdot}960\\ \cline{2-2} 5 & \;\;\;{\cdot}7920\\ \cline{2-2} & \;\;\;{\cdot}1584\end{array}\right.;$$

$$1024\left\{\begin{array}{r|l}8 & 3{\cdot}000\\ \cline{2-2} 8 & \;{\cdot}375000\\ \cline{2-2} 8 & \;{\cdot}046875000\\ \cline{2-2} 2 & \;{\cdot}0058593750\\ \cline{2-2} & \;{\cdot}0029296875\end{array}\right. \qquad \therefore \text{Ans.} = 84{\cdot}0029296875.$$

(4)

$$\tfrac{5}{8} \text{ of } \tfrac{13}{16} = \tfrac{65}{128}, \qquad 128\left\{\begin{array}{r|l}4 & 65{\cdot}00\\ \cline{2-2} 4 & 16{\cdot}2500\\ \cline{2-2} 8 & \;\;4{\cdot}0625000\\ \cline{2-2} & \;\;\;{\cdot}5078125\end{array}\right.;$$

$$3\tfrac{1}{3} \text{ of } 2\tfrac{4}{5} = 8\tfrac{3}{4}, \qquad \begin{array}{r|l}4 & 3{\cdot}00\\ \cline{2-2} & \;{\cdot}75\end{array} \qquad \therefore \text{Ans.} = 8{\cdot}75;$$

$$3\tfrac{1}{2} \text{ of } 4\tfrac{1}{4} \text{ of } 5\tfrac{1}{8} = 76\tfrac{15}{64}, \quad 64\left\{\begin{array}{r|l}8 & 15{\cdot}000\\ \cline{2-2} 8 & \;\;1{\cdot}875000\\ \cline{2-2} & \;\;\;{\cdot}234375\end{array}\right. \quad \therefore \text{Ans.} = 76{\cdot}234375.$$

(5)

$$1\tfrac{3}{5} - \tfrac{13}{16} + 3\tfrac{5}{40}, \qquad \begin{array}{r|l}5 & 3{\cdot}0\\ \cline{2-2} & \;{\cdot}6\end{array} \qquad \therefore 1\tfrac{3}{5} = 1{\cdot}6;$$

$$\begin{array}{l}1{\cdot}6 - {\cdot}8125 = {\cdot}7875\\ {\cdot}7875 + 3{\cdot}125 = 3{\cdot}9125,\end{array} \quad 16\left\{\begin{array}{r|l}4 & 13{\cdot}0\\ \cline{2-2} 4 & \;\;3{\cdot}25\\ \cline{2-2} & \;\;\;{\cdot}8125\end{array}\right. \quad \therefore \tfrac{13}{16} = {\cdot}8125;$$

(Continued on next page.)

(5 continued.)

$$40\left\{\begin{array}{l}5\\8\\ \end{array}\right.\left|\begin{array}{r}5\cdot\\ \hline 1\cdot000\\ \hline \cdot125\end{array}\right.\qquad\therefore\ 3\tfrac{5}{40}=3\cdot125;$$

$11\frac{1}{2}+\cdot75$ of $\frac{24}{25}$ of $6\frac{3}{4}=11\cdot5+\cdot75$ of $\frac{162}{25}=11\cdot5+\cdot75\times 6\frac{12}{25}=11\cdot5+\cdot75\times6\cdot48=11\cdot5+4\cdot86=16\cdot36.$

Ex. LXI. (p. 104.)

(1)

$$3\,\underline{|2\cdot0}\ \ \cdot\dot{6};\quad 9\,\underline{|1\cdot0}\ \ \cdot\dot{1};\quad 7\,\underline{|6\cdot0}\ \ \cdot\dot{8}5714\dot{2};\quad 12\,\underline{|7\cdot0}\ \ \cdot\dot{5}8\dot{3};\quad 15\left\{\begin{array}{l}5\\3\\ \end{array}\right.\left|\begin{array}{r}11\cdot0\\ \hline 2\cdot2\\ \hline \cdot7\dot{3}.\end{array}\right.$$

(2)

$$81\left\{\begin{array}{l}9\\9\\ \end{array}\right.\left|\begin{array}{r}3\cdot\\ \hline \dot{3}3333\\ \hline \cdot\dot{0}3\dot{7}\end{array}\right.\quad\therefore\ \text{Ans.}=6\cdot\dot{0}3\dot{7};$$

$$\begin{array}{l}37)5\cdot0(\cdot\dot{1}3\dot{5}\\ \ \ \ \ \ 37\\ \hline \ \ \ \ \ \ 130\\ \ \ \ \ \ \ 111\\ \hline \ \ \ \ \ \ \ 190\\ \ \ \ \ \ \ \ 185\\ \hline \ \ \ \ \ \ \ \ \ 50\end{array}\qquad\therefore\ \text{Ans.}=7\cdot\dot{1}3\dot{5};$$

$$44\left\{\begin{array}{l}4\\11\\ \end{array}\right.\left|\begin{array}{r}7\cdot00\\ \hline 1\cdot75\\ \hline \cdot15\dot{9}\dot{0}\end{array}\right.\quad\therefore\ \text{Ans.}=100\cdot15\dot{9}\dot{0};$$

$$17)15\cdot0(\cdot\dot{8}82352941176470\dot{5}$$

$$\begin{array}{rrrr}136 & & & \\ \hline 140 & 50 & 30 & 120\\ 136 & 34 & 17 & 119\\ \hline 40 & 160 & 130 & 100\\ 34 & 153 & 119 & 85\\ \hline 60 & 70 & 110 & 150\\ 51 & 68 & 102 & 136\\ \hline 90 & 20 & 80 & \\ 85 & 17 & 68 & \\ \hline \end{array}$$

$\therefore$ Ans. $=2\cdot\dot{8}82352941176470\dot{5}.$

(3)

$$495\left\{\begin{array}{r|r} 5 & 67\cdot0 \\ \cline{2-2} 9 & 13\cdot4 \\ \cline{2-2} 11 & 1\cdot488 \\ \cline{2-2} & \cdot1\dot{3}\dot{5} \end{array}\right. \qquad 1375\left\{\begin{array}{r|r} 5 & 17\cdot0 \\ \cline{2-2} 5 & 3\cdot40 \\ \cline{2-2} 5 & \cdot680 \\ \cline{2-2} 11 & \cdot136 \\ \cline{2-2} & \cdot012\dot{3}\dot{6} \end{array}\right.$$

$\therefore$ Ans. $= 11\cdot1\dot{3}\dot{5}$; $\qquad\therefore$ Ans. $= 23\cdot012\dot{3}\dot{6}$.

(4)

$\cdot\dot{2} = \frac{2}{9}$; $\cdot\dot{0}\dot{5} = \frac{5}{99}$; $\cdot\dot{1}\dot{8} = \frac{18}{99} = \frac{2}{11}$; $\cdot1\dot{5}\dot{6} = \frac{156-1}{990} = \frac{155}{990} = \frac{31}{198}$; $\cdot0270\dot{2}\dot{7} = \frac{27027-27}{999000} = \frac{27000}{999000} = \frac{1}{37}$;
$\cdot\dot{2}8571\dot{4} = \frac{285714}{999999} = \frac{2}{7}$.

(5)

$\cdot5\dot{6}6 = \frac{566-56}{900} = \frac{510}{900} = \frac{17}{30}$; $\cdot7\dot{4}\dot{3} = \frac{743-7}{990} = \frac{736}{990} = \frac{368}{495}$; $\cdot2\dot{0}23\dot{5} = \frac{20235-2}{99990} = \frac{20233}{99990}$; $19\cdot30\dot{5} = 19\frac{305-30}{900} \doteq 19\frac{275}{900} = 19\frac{11}{36}$; $20\cdot0291\dot{6} = 20\frac{2916-291}{90000} = 20\frac{2625}{90000} = 20\frac{7}{240}$.

(6)

$6\cdot18153\dot{1}5\dot{3} = 6\cdot18\dot{1}5\dot{3} = 6\frac{18153-18}{99900} = 6\frac{18135}{99900} = 6\frac{403}{2220}$;
$15\cdot692307\dot{6}9230\dot{7} = 15\cdot\dot{6}9230\dot{7} = 15\frac{692307}{999999} = 15\frac{9}{13}$.

(7)

$$\begin{array}{r} 4\cdot3333333 \\ 16\cdot4545454 \\ 75\cdot7352352 \\ \hline 96\cdot5231139 \end{array}$$

$\because$ Ans. $= 96\cdot523114$.

(8)

$$\begin{array}{r} 3\cdot2333333 \\ 26\cdot7967967 \\ 7\cdot4134134 \\ \hline 37\cdot4435434 \end{array}$$

$\therefore$ Ans. $= 37\cdot443543$.

(9)

$$\begin{array}{r} 3\cdot8564646 \\ 2\cdot0387777 \\ \hline 1\cdot8176869 \end{array}$$

$\therefore$ Ans. $= 1\cdot817686$.

(10)

$$\begin{array}{r} 52\cdot8666666 \\ 8\cdot3723572 \\ \hline 44\cdot4943094 \end{array}$$

$\therefore$ Ans. $= 44\cdot494309$.

(11)

$7\cdot\dot{6} + 5\cdot\dot{3} = 7\frac{2}{3} \times 5\frac{1}{3} = 40\frac{8}{9} = 40\cdot\dot{8}$; $\cdot\dot{3}5\dot{1} \times \cdot7\dot{3}\dot{6} = \frac{351}{999} \times \frac{729}{990} = \frac{13}{37} \times \frac{81}{110} = \frac{1053}{4070} = \cdot2\dot{5}8722\dot{3}$; $\cdot1\dot{3} \times \cdot2 \times \cdot\dot{4} = \frac{12}{90} \times \frac{1}{5} \times \frac{4}{9} = \frac{2}{15} \times \frac{1}{5} + \frac{4}{9} = \frac{8}{675} = \cdot01\dot{1}8\dot{5}$.

(12)

$$6\cdot\dot{7} \div 2\cdot\dot{6} = 6\tfrac{7}{9} \div 2\tfrac{2}{3} = \tfrac{61}{9} \times \tfrac{3}{8} = \tfrac{61}{24} = 2\tfrac{13}{24} = 2\cdot541\dot{6};\ \cdot26\dot{2}\dot{7} \div 1\cdot92\dot{6} = \tfrac{2627-26}{9900} \div 1\tfrac{926-92}{900} = \tfrac{2601}{9900} \div 1\tfrac{834}{900} = \tfrac{289}{1100} \div \tfrac{900}{1734} = \tfrac{2601}{19074} = \cdot1\dot{3}\dot{6};\ \cdot3\dot{7}\dot{1} \div 5 = \tfrac{371-3}{990} \div 5 = \tfrac{368}{990} \div 5 = \tfrac{184}{2475} = \cdot07\dot{4}\dot{3};\ 42\cdot0463 \div 1\dot{3}\dot{6} = 42\tfrac{463}{10000} \div 1\tfrac{36}{99} = 42\tfrac{463}{10000} \times \tfrac{11}{15} = \tfrac{4625093}{1500000} = 30\cdot83395\dot{3}.$$

Ex. LXII. (p. 105.)

(1)

·75
100

75·00 cts.
Ans. 75 cts.

(2)

·875
5

$4·375
100

37·500 cts. Ans. $4.37½ cts.

(3)

·625
100

62·500 cts.
Ans. 62½ cts.

(4)

·625 cwt.
4

2·500 qrs.
25

2500
1000

12·500 lbs.
16

3000
500

8·000 oz. Ans. 2 qrs. 12 lbs. 8 oz.

(5)

·375
8

3·000 fur.
Ans. 3 fur.

(6)

·175
20

3·500 cwt.
4

2·000 qrs.
Ans. 3 cwt. 2 qrs.

(7)
·46875
50
23·43750s.
12
5·25000d.
4
1·00000q. Ans. 23s. 5¼d.

(8)
·0625
90
5·6250d.
4
2·5000q.
Ans. 5½d. 5q.

(9)
·175
12
2·100 oz.
20
2·000 dwt.
Ans. 2 lbs. 2 oz. 2 dwt.

(10)
4·65 × 4 a. 2 ro.
4·65
18
3720
465
83·70 ro.
40
28·00 per.
Ans. 83 ro. 28 per., or 20 a. 3 ro. 28 per.

(11)
10·04
100
1004·00 per.
Ans. 1004 per., or 6 a. 1 ro. 4 per.

(12)
2·56
525
1280
512
1280
1344·00 qrs.
Ans. 1344 qrs., or £1 8s.

(13)
5·00875
25
2504375
1001750
125·21875 dys.
24
87500
43750
5·25000 hrs.
60
15·00000 min.

Ans. 125 dys. 5 hrs. 15 min.,
or 17 wks. 6 dys. 5 hrs. 15 min.

(14)
·504
24
2016
1008
12·096 hrs.
60
5·760 min.
60
45·600 sec.
Ans. 12 dys. 12 hrs. 5 min. 45·6 sec.

(15)
5 lbs. 2 sc. = 1442 sc.
3·05
7210
4326
4398·10
20
2·00 grs.
Ans. 4398 sc. 2 grs., or 15 lbs. 3 oz. 2 drs. 2 grs.

(16)
£4 1s. = 81s.
3·0085
81
30085
240680
243·6885s.
12
8·2620d.
4
1·0480q.
Ans. 243s. 8d. 1·048q. or £12 3s. 8¼d. ·048q.

(17)
1 ac. 3 ro. 5 po. = 285 po.
7·034
585
35170
56272
14068
2004·690 per.
30¼
20700
1725
20·8725 yds.
9
7·8525 ft.
144
34100
34100
8525
122·7600 in.
Ans. 2004 po. 20 yds. 7 ft. 122·76 in. or 12 a. 2 ro. 4 po. 20 yds. 7 ft. 122·76 in.

(18)

16 lbs. 1 oz. 6 grs. = 92646 grs.

$$\begin{array}{r} 92646 \\ 5{\cdot}005 \\ \hline 463230 \\ 463230 \\ \hline 463693{\cdot}230 \end{array}$$

463693·230 grs.,
or 80 lbs. 6 oz. 13·23 grs.

(19) $\cdot\dot{3}$ of \$2 $= \frac{3}{9}$ or $\frac{1}{3}$ of \$2 $= 66\frac{2}{3}$ cts.

(20) $\cdot\dot{5}\dot{4}$ of 16s. 6d. $= \frac{54}{99}$ of 198d. = 108d. = 9s.

(21) $\cdot 24\dot{3}$ of a ton $= \frac{243-24}{900}$ of 20 cwt. $= \frac{219}{900}$ of 20 cwt. $= \frac{73}{300}$ of 20 cwt. = 4 cwt. 3 qrs. 11 lbs. 10 oz. $10\frac{2}{3}$ drs.

(22) $6{\cdot}8\dot{3}$ of £5 $= 6\frac{83-8}{90}$ of £5 $= 6\frac{75}{90}$ of £5 $= 6\frac{5}{6}$ of £5 $=$ £$34\frac{1}{6}$ = £34 3s. 4d.

(23) $2{\cdot}38\dot{3}$ of $2\frac{1}{2}$ lbs. $= 2\frac{383-38}{900}$ of $2\frac{1}{2}$ lbs. $= 2\frac{345}{900}$ of $2\frac{1}{2}$ lbs. $= 2\frac{23}{60}$ of 2 lbs. 6 oz. $= 2\frac{23}{60}$ of 30 oz. $= 71\frac{1}{2}$ oz. = 5 lbs. 11 oz. 10 dwt.

(24) $6{\cdot}\dot{2}$ of a c. yd. $= 6\frac{2}{9}$ of 27 c. ft. = 168 c. ft. = 6 c. yds. 6 c. ft.

(25) $18{\cdot}\dot{7}\dot{2}$ of an ac. $= 18\frac{72}{99}$ ac. $= 18\frac{8}{11}$ ac. = 18 ac. 2 ro. 36 po. 11 yds.

(26) $2{\cdot}06\dot{3}$ of 1000 guineas $= 2\frac{63-6}{9000}$ of 1000 gs. $= 2\frac{57}{9000}$ of 1000 gs. $= 2\frac{19}{3000}$ of 1000 gs. $= 2006\frac{1}{3}$ gs. = 2006 gs. 7s. = £2166 10s.

(27)

$$\begin{array}{r} £{\cdot}634375 \\ 20 \\ \hline 12{\cdot}687500\text{s.} \\ 12 \\ \hline 8.250000\text{d.} \\ 4 \\ \hline 1{\cdot}000000\text{q.} \end{array}$$

$$\begin{array}{r} {\cdot}025 \\ 25 \\ \hline 125 \\ 50 \\ \hline {\cdot}625\text{s.} \\ 12 \\ \hline 7{\cdot}500\text{d.} \\ 4 \\ \hline 2{\cdot}000 \end{array}$$

$3{\cdot}1\dot{6}$ of 30s. $= 3\frac{16-1}{90}$ of 30s. $= 3\frac{1}{6}$ of 30s. = 95s. = £4 15s.

∴ value req^{d} = 12s. $8\frac{1}{4}$d. + $7\frac{1}{2}$d + £4·15 = £5 8s. $3\frac{3}{4}$d.

(28) $\cdot\dot{6}$ of an ac. $= \frac{6}{9}$ ac. $= \frac{2}{3}$ ac. $= 2$ ro. 26 po. 20 yds. 1 ft. 72 in.; $\cdot625$ of a ro. $= \cdot625$ of 40 po. $= 25$ po. $\frac{4}{11}$ po. $= \frac{4}{11}$ of $30\frac{1}{4}$ yds. $= 11$ yds.

2 ro. 26 po. 20 yds. 1 ft. 72 in. + 25 po. 11 yds. = 3 ro. 11 po. 9 yds. 1 ft. 72 in.

(29) $6\cdot\dot{7}1428\dot{5}$ of 1s. 9d. $= 6\frac{714285}{999999}$ of 21d. $= 6\frac{5}{7}$ of 21d. $= 141$d. $= 11$s. 9d.; $\cdot083\dot{3}$ of £7 4s. $= \frac{833-83}{9000}$ of 144s. $= \frac{750}{9000}$ of 144s. $= \frac{1}{12}$ of 144s. $= 12$s.; $\cdot251\dot{1}9047\dot{6}$ of 6s. 8d. $= \frac{251190476-251}{999999000}$ of 80d. $= \frac{251190225}{999990000}$ of 80d. $= \frac{211}{140}$ of 80d. $= 1$s. $8\frac{2}{21}$d.

∴ value req$^{\text{d}}$ = 11s. 9d. − 12s. + 1s. $8\frac{2}{21}$d. = 1s. $5\frac{2}{21}$d.

Ex. LXIII. (p. 106.)

(1)

1 qr. 5 lbs. = 30 lbs.
1 cwt. = 4 × 25 = 100 lbs.
∴ fr. req$^{\text{d}}$ is $\frac{30}{100}$ or $\frac{3}{10} = \cdot3$.
or thus:

$$\begin{array}{r|l} 25 & 5\cdot \\ \cline{2-2} 4 & 1\cdot2 \\ \cline{2-2} & \quad\cdot3 \end{array}$$

(2)

\$2·50 = 250 cts.
\$10 = 1000 cts.
∴ fr. req$^{\text{d}}$ $= \frac{250}{1000} = \frac{1}{4} = \cdot25$.

(3)

$$\begin{array}{r|l} 60 & 30\cdot \\ \cline{2-2} 24 & \quad 3\cdot5 \\ \cline{2-2} & \quad\ \cdot1458\dot{3} \end{array}$$

(4)

$$\begin{array}{r|l} 40 & 11\cdot \\ \cline{2-2} 4 & \quad 3\cdot275 \\ \cline{2-2} & \quad\ \cdot8175 \end{array}$$

(5)

$$\begin{array}{r|l} 4 & 2\cdot \\ \cline{2-2} 12 & 6\cdot5 \\ \cline{2-2} & \quad \cdot541\dot{6} \end{array}$$

(6) 2 fur. = $(2 \times 40 \times 5\frac{1}{2} \times 3 \times 12)$ in. = 15840 in.
∴ fr. req$^{\text{d}}$ is $\frac{3\frac{1}{2}}{15840} = \frac{7}{31680} = \cdot000220\dot{9}\dot{5}$.
(7) 2 oz. 13 dwt. = 53 dwt.; 1 lb. = 240 dwt.
∴ fr. req$^{\text{d}}$ $= \frac{53}{240} = \cdot2208\dot{3}$.
(8) 4 lbs. 2 sc. = 1154 sc.; 1 oz. = 24 sc.
∴ fr. req$^{\text{d}}$ $= \frac{1154}{24} = 48\cdot08\dot{3}$.

(9)

$$144\left\{\begin{array}{r|l} 12 & 73\cdot \\ \cline{2-2} 12 & \quad 6\cdot083333 \\ \cline{2-2} 9 & \quad 2\cdot5069444 \\ \cline{2-2} & \qquad \cdot2785\dot{4}9382716\dot{0} \end{array}\right.$$

(10

1 lb. Troy = 5760 grs.
1 lb. Avoir. = 7000 grs.
$\frac{5760}{7000} = \cdot82\dot{2}8571\dot{4}$.

(11)

$$\begin{array}{r|r} 12 & 9{\cdot} \\ \cline{2-2} 20 & 10{\cdot}75 \\ \cline{2-2} & {\cdot}5375 \end{array}$$

(12)

$$\begin{array}{r|r} 12 & 7{\cdot} \\ \cline{2-2} 20 & 17{\cdot}5833 \\ \cline{2-2} & {\cdot}8791\dot{6} \end{array}$$

(13) 2 wks $6\frac{1}{4}$ dys. = 486 hrs.; 4 dys. 3 hrs. = 99 hrs.

$\therefore$ fr. req^d $= \frac{486}{99} = 4{\cdot}\dot{9}\dot{0}$.

(14) 2 lbs. 14 oz. = 46 oz.; 18 lbs. = 288 oz.

$\therefore$ fr. req^d $= \frac{46}{288} = \frac{23}{144} = {\cdot}1597\dot{2}$.

Ex. LXIV. (p. 107.)

PAPER I.

(3)

(1)

$$\begin{array}{r} 1018269 \\ 20979 \\ 100001050 \\ 54000003000 \\ 400000006 \\ 999990 \\ \hline 54502043294 \end{array}$$

(2)

$$\begin{array}{r} 400001 \\ 300725 \\ \hline 99276 \end{array}$$

(4)

$$\begin{array}{r} 268936785 \\ 5689 \\ \hline 2420431065 \\ 2151494280 \\ 1613620710 \\ 1344683925 \\ \hline 1529981369865 \end{array}$$

$$\begin{array}{r} 268936785)\,1529981369865\,(5689 \\ 1344683925 \\ \hline 1852974448 \\ 1613620710 \\ \hline 2393537386 \\ 2151494280 \\ \hline 2420431065 \\ 2420431065 \end{array}$$

Multiplication may be proved by division and *visa versa*.

(5)

$6974)\,27027027027\,(3875398\frac{1375}{6974}$

20922

61050
55792

52582
48818

37647
34870

27770
20922

68482
62766

57167
55792

1375

3875398
6974

15501592
27127786
34878582
23252388

27027025652
1375

27027027027

(6)

mi.	fur.	per.
12	2	6

8

98
40

3926
5½

19630
1963

21593
3

64779
12

777348

12 | 777348 in.
3 | 64779 ft.
5½ | 21593 yds.
2
11 | 43186
40 | 3926 per.
8 | 98·6 per
12·2 fur.

12 mi. 2 fur. 6 per.

PAPER II.

(1)

$$\begin{array}{r|rrrr}
2 & 27 & 36 & 42 & 48 \\ \hline
2 & 27 & 18 & 21 & 24 \\ \hline
3 & 27 & 9 & 21 & 12 \\ \hline
 & 9 & \cancel{3} & 7 & 4
\end{array}$$

L. C. M. $= 2 \times 2 \times 3 \times 9 \times 7 \times 4 = 3024$.

(3)

$$\begin{array}{r|rrrrr}
3 & \cancel{2} & \cancel{3} & 5 & 6 & 9 \\ \hline
 & & & 5 & 2 & 3
\end{array}$$

L. C. M. $= 3 \times 5 \times 2 \times 3 = 90$.

(4)

$$\begin{array}{r|rr}
2 & 8 & 14 \\ \hline
 & 4 & 7
\end{array}$$

L. C. M. $= 2 \times 4 \times 7 = 56$; $1000 \div 56 = 17\frac{6}{7}$.

$\therefore$ Ans. 17 times.

(5)

(1) $126\frac{1}{4} + 40\frac{1}{2} + 10\frac{1}{2} + 11\frac{1}{2} + 50\frac{1}{2} = 239\frac{1}{4}$ miles.

(2)

$$\begin{array}{r}
4380000 \\
8550000 \\
1500000 \\
550000 \\
7000000 \\
560000 \\ \hline
\$22540000
\end{array}$$

$$\begin{array}{rl}
957) & 87920000\,(91870{\cdot}42 \\
 & 8613 \\ \hline
 & \;\;1790 \\
 & \;\;\;957 \\ \hline
 & \;\;\;8330 \\
 & \;\;\;7656 \\ \hline
 & \;\;\;\;6740 \\
 & \;\;\;\;6699 \\ \hline
 & \;\;\;\;\;4100 \\
 & \;\;\;\;\;3828 \\ \hline
 & \;\;\;\;\;\;2720
\end{array}
\qquad
\begin{array}{r}
2720 \\
1914 \\ \hline
806
\end{array}$$

(3) $\$22540000 - \$560000 = \$21980000$; $\$21980000 \div 239\frac{1}{4} = 87920000 \div 957 = \$91870.42$ and \$8.06 over.

PAPER III.

(1)

(¹) $2\frac{1}{4}\left(\frac{1}{6}+\frac{2}{3}\right)+\frac{4}{9}\left(\frac{2}{3}-\frac{1}{7}\right)=\left(2\frac{1}{4}\times\frac{5}{6}\right)+\left(\frac{4}{9}\times\frac{11}{21}\right)=\frac{15}{8}+\frac{44}{189}=1\frac{7}{8}+\frac{44}{189}=1\frac{1323+352}{1512}=1\frac{1675}{1512}=2\frac{163}{1512}$.

(²) $2\frac{1}{4}\left\{\left(\frac{1}{6}+\frac{2}{3}\right)+\frac{4}{9}\left(\frac{2}{3}-\frac{1}{7}\right)\right\}=2\frac{1}{4}\left\{\frac{5}{6}+\left(\frac{4}{9}\times\frac{11}{21}\right)\right\}=2\frac{1}{4}\left(\frac{5}{6}+\frac{44}{189}\right)=2\frac{1}{4}\times\frac{403}{378}=\frac{9}{4}\times\frac{403}{378}=2\frac{67}{168}$.

(2) $\frac{3}{4}$ of $\frac{1}{2}$ = \$15000, or $\frac{3}{8}$ = \$15000; ∴ $\frac{1}{8}$ = \$5000, and the whole steamer is worth \$5000 × 8 = \$40000. If he sells $\frac{3}{8}$ he has remaining $\frac{1}{2}-\frac{3}{8}=\frac{1}{8}$; $\frac{1}{8}$ of \$40000 = \$5000.

(3)

(¹) $\frac{7}{12}\left(8\frac{1}{4}-2\frac{1}{2}\right)-\frac{1}{2}\left(\frac{3}{8}-\frac{1}{11}\right)=\frac{7}{12}\times5\frac{3}{4}-\frac{1}{2}\times\frac{25}{88}=\frac{161}{48}-\frac{25}{176}=\frac{1771-75}{528}=3\frac{7}{33}$.

(²) $\frac{7}{12}\left\{\left(8\frac{1}{4}-2\frac{1}{4}\right)-\frac{1}{2}\left(\frac{3}{8}-\frac{1}{11}\right)\right\}=\frac{7}{12}\left\{5\frac{3}{4}-\frac{25}{176}\right\}=\frac{7}{12}\times\frac{987}{176}=\frac{2303}{704}=3\frac{191}{703}$.

(4) ·55 × £5 = £2·75, or £2 15s.; 5·5 × £5 = £27·5, or £27 10s., and £27 10s. − £2 15s. = £24 15s.

(5) 1·25 yds. = $\frac{5}{3}$ of ·75 yds. ∴ No. yds. req^{d} = $\frac{5}{3}$ of 87 = 145 yds.; and 145 yds. − 87 yds. = 58 yds.

(6) ·5 = $\frac{1}{2}$ = part given to *A*; $1-\frac{1}{2}=\frac{1}{2}$ = part remaining; $\cdot\dot{3}$ of $\frac{1}{2}=\frac{3}{9}$ of $\frac{1}{2}=\frac{1}{3}$ of $\frac{1}{2}=\frac{1}{6}$ = part given to *C*: $\frac{1}{2}+\frac{1}{6}=\frac{4}{6}=\frac{2}{3}$ = whole part give away; $1-\frac{2}{3}=\frac{1}{3}$ = part remaining to *A*.

PAPER IV.

(1) $\frac{1}{3}$ = part sold to *A*; $\frac{2}{3}$ = part remaining; $\frac{1}{5}$ of $\frac{2}{3}=\frac{2}{15}$ = part sold to *B*; $1-\left(\frac{1}{3}+\frac{2}{15}\right)=\frac{8}{15}$ = part sold to *C*, which by the question = 32. If $\frac{8}{15}=32$ then $\frac{1}{15}=32\div8=4$, and $\frac{15}{15}$ or the whole = 4 × 15 = 60.

(2) $13\frac{1}{2}+56\frac{3}{4}+14\frac{5}{8}=13+56+14+\frac{1}{2}+\frac{3}{4}+\frac{5}{8}=83+\frac{4+6+5}{8}=84\frac{7}{8}$ = 84·875.

$13\frac{1}{2}$ = 13·5; $56\frac{3}{4}$ = 56·75; $14\frac{5}{8}$ = 14·625.

```
     ∴ Sum is                 (3)              ——
        13·5           2·7)·033372(·01236      97
        56·75               27                 81
        14·625              ——                 ——
        ——————               63               162
        84·875               54               162
                             ——
```

(4)

$$\begin{array}{rr@{\qquad}rr}
27\times\ 4 = & \$108.00 & 19\times\ 4 = & \$76.00\\
6\times20 = & 1.20 & 5\times20 = & 1.00\\
9\frac{1}{2}\times4\times5\div12 = & .15\frac{5}{6} & 8\times4\times5\div12 = & .13\frac{1}{3}\\
\cline{2-2}\cline{4-4}
 & \$109.35\frac{5}{6} & & \$77.13\frac{1}{3}\\
 & & & \$109.35\frac{5}{6}\\
3\times\ 4 = & \$12.00 & & \$\ 17.22\\
12\times20 = & 2.40 & & \$\ 77.13\frac{1}{3}\\
7\times4\times5\div12 = & .11\frac{2}{3} & & \$198.05\\
\cline{2-2}
 & & & \$\ 14.51\frac{2}{3}\\
 & \$14.51\frac{2}{3} & & \\
\cline{4-4}
 & & & \$416.27\frac{5}{6}.
\end{array}$$

(5) ·875 $= \frac{875}{1000} = \frac{7}{8}$; $21 = \frac{7}{8}$ of the larger side, or $\frac{1}{8} = 3$ and $\frac{8}{8}$ or the whole $= 24$; $21 + 24 = 45 =$ whole number of players, which is equal to ·625 or $\frac{625}{1000}$, or $\frac{5}{8}$ of the onlookers; if $\frac{5}{8} = 45$, $\frac{1}{8} = 45 \div 5 = 9$, and $\frac{8}{8}$ or the whole $= 9 \times 8 = 72$.

(6) $\cdot014$ of $1\frac{2}{5}$ of $\dfrac{1\frac{1}{5}}{5\frac{2}{5}}$ of $\frac{5}{7}$ of $4\cdot5$ of $\dfrac{\frac{2}{3}+\frac{1}{2}}{\frac{2}{3}-\frac{1}{2}}$ of $71\frac{3}{7} = \frac{14}{1000}$ of $\frac{7}{5}$ of $\dfrac{\frac{6}{5}}{\frac{27}{5}}$ of $\frac{5}{7}$ of $4\frac{1}{2}$ of $\dfrac{\frac{7}{6}}{\frac{1}{6}}$ of $\frac{500}{7} = \frac{7}{500}$ of $\frac{7}{5}$ of $\frac{2}{9}$ of $\frac{5}{7}$ of $\frac{9}{2}$ of $\frac{7}{1}$ of $\frac{500}{7} = 7$.

∴ one side scores 7 times as many runs as the other.

PAPER V.

(1) Let 1 represent what *B* owes to *A;* then ·6, or $\frac{6}{10}$ or $\frac{3}{5} =$ what *C* owes to *B;* $1-\frac{3}{5} = \frac{2}{5} =$ how much *B's* debt to *A* exceeds that of *C's* to *B*. If $\frac{2}{5} =$ 5s. then $\frac{1}{5} =$ 2s. 6d., and $\frac{5}{5}$, or the whole $=$ 2s. 6d. $\times 5 =$ 12s. 6d.

(2) $\frac{1}{2}+$50s. $=$ what was first taken out; ∴ $\frac{1}{2}-$50s. $=$ what then remained. ·2 or $\frac{2}{10}$, or $\frac{1}{5}$ of ($\frac{1}{2}-$50s.)$+$30s. $= \frac{1}{10}+$20s. $=$ what was next taken; ($\frac{1}{2}+$50s.)$+$($\frac{1}{10}+$20s.) $=$ ($\frac{6}{10}+$70s.) $=$ what had then been taken out; ∴ $\frac{4}{10}-$70s. $=$ what was left. ·25 or $\frac{25}{100}$, or $\frac{1}{4}$ of ($\frac{4}{10}-$70s.)$+$20s. $= \frac{1}{10} - 17\frac{1}{2}$s. $+$ 20s. $= \frac{1}{10}+2\frac{1}{2}$s. $=$ what was taken out the third time. ($\frac{6}{00}+$70s.) $+$ ($\frac{1}{10}+2\frac{1}{2}$s.) $= \frac{7}{10}+72\frac{1}{2}$s. $=$ total amount taken out; ∴ $\frac{3}{10}-72\frac{1}{2}$s. $=$ amount remaining in the bag, which by the question $=$ 10s. ∴ $\frac{3}{10}-72\frac{1}{2}$s. $=$ 10s., or $\frac{3}{10} = 82\frac{1}{2}$s., or $\frac{1}{10} = 27\frac{1}{2}$s., ∴ $\frac{10}{10}$ or the whole $= 27\frac{1}{2}$s. $\times 10 =$ 275s.

(3) *A* supplies 26 cub. yds. in $3\frac{1}{4}$ hrs., or 8 cub. yds. per hr.; *B* supplies $12\frac{1}{2}$ cub. yds. in $2\frac{1}{2}$ hrs., or 5 cub. yds. per hr. Together *A* and *B* supply $8 + 5 = 13$ cub. yds. per hr. *C* discharges 11·375, or $11\frac{3}{8}$ cub. yds. in $1\frac{3}{4}$ hrs., or $6\frac{1}{2}$ cub. yds. per hr.

In 12 hrs. *A* will supply $8 \times 12 = 96$ cub. yds.; and *C* will discharge $6\frac{1}{2} \times 12 = 78$ cub. yds.; $\therefore$ the number of cub. yds. actually filled will be $96 - 78 = 18$. Number cub. yds. requiring to be filled $= \cdot 75$, or $\frac{3}{4}$ of $286 = 214\frac{1}{2}$ cub. yds., and number already filled $= 18$; $\therefore$ No. remaining to be filled $= 214\frac{1}{2} - 18 = 196\frac{1}{2}$ cub. yds. Now if *A* and *B* together fill 13 cub. yds. per hr. while *C* discharges $6\frac{1}{2}$ cub. yds. per hr., the number of cub. yds. actually filled per hr. is $13 - 6\frac{1}{2} = 6\frac{1}{2}$; and number of hrs. required to fill $196\frac{1}{2}$ cub. yds. $= 196\frac{1}{2} \div 6\frac{1}{2} = 30\frac{3}{13}$ hrs., which added to the previous 12 hrs. will amount to $42\frac{3}{13}$ hrs.

(4)

500	envelopes at 44 cts. per 100	=$ 2.20
3	boxes elastic bands at 33 cts.	=$ 0.99
½	gross penholders at 19 cts. per doz.	=$ 1.14
2½	reams foolscap at 21 cts. a quire	=$10.50
4	doz. quill pens at 9 cts.	=$ 0.36
13	note books at 27 cts.	=$ 3.51
250	official envelopes at 48 cts. per 100	=$ 1.20
		$19.90

(5)

7½	lbs. lamb at 10 cts.	=$0.75
19½	lbs. mutton at 8 cts.	=$1.56
18	lbs. ham at 15 cts.	=$2.70
5½	lbs. suet at 10 cts.	=$0.55
9	chops at 4 cts.	=$0.36
		$5.92

(6)

17	yds calico at 19 cts.	=$ 3.23
25½	yds. —— at 55 cts.	=$14 02½
34½	yds. flannel at 60 cts.	=$20.70
14	pairs stockings at 38 cts.	=$ 5.32
5	pairs gloves at $12 per doz.	=$ 5.00
		$48.27½

Ex. LXV. (p. 112.)

(1) $\frac{9\times12}{4}=27.$ (2) $\frac{9\times24}{32}=6\frac{3}{4}.$ (3) $\frac{6\times10}{4}=15.$ (4) $\frac{\frac{1}{3}\times\frac{1}{4}}{\frac{1}{2}}=\frac{1}{6}.$

(5) $\frac{\cdot8\times\cdot79}{\cdot05}=\cdot12\cdot64.$ (6) $\frac{10\times4\cdot5}{\cdot3}=15.$ (7) $\frac{\frac{5}{7}\times\frac{16}{27}}{\frac{10}{21}}=\frac{8}{9}.$

(8) $\frac{1\cdot2\times\cdot39}{1\cdot3}=\cdot36.$ (9) $\frac{\frac{9}{14}\times\frac{7}{18}}{\frac{1}{3}}=\frac{3}{4}.$ (10) $\frac{4\cdot2\dot{2}\times17\cdot6}{23\frac{2}{9}}=3\cdot2.$

Ex. LXVI. (p. 115.)

(1) 8 bus. : 24 bus. :: \$16 is to the price required.

∴ Price required $= \$\frac{24\times16}{8}=\$48.$

(2) 2 bus. : 33 bus. :: \$1.10 : required price.

∴ Required price $= \$\frac{33\times1.10}{2}=\$18.15.$

(3) 9 bus. : 4 bus. 20 lbs. :: \$36 : required cost.

∴ Required cost $= \$\frac{260\times36}{540}=\$17.33\frac{1}{3}.$

(4) 55 cts. : \$21.25 :: 1 bus. : no. of bus. required.

∴ No. required $= \frac{2125\times1}{55}$ bus. = 38 bus. $21\frac{7}{11}$ lbs.

(5) 84 cts. : \$17.20 :: 1 bus. : number required.

∴ No. required $= \frac{1720\times1}{84}$ bus. = 20 bus. $28\frac{4}{7}$ lbs.

(6) 1 oz. : 21 lbs. 4 oz. :: 6s. 5d. : required price.

∴ Required price $= \frac{256\times77}{1}$d. = 19712d. = £82 2s. 8d.

(7) 16 cts. : \$462.36 :: 1 lb. : number required.

∴ No. required $= \frac{46236\times1}{16}$lbs. = $2889\frac{3}{4}$ lbs. = 28 cwt. 3 qrs. 14 lbs. 12 oz.

(8) \$23856 : \$10496.64 :: \$1 : dividend in \$1.

∴ Dividend required $= \$\frac{1049664\times1}{2385600}=\$\cdot44=44$ cts.

(9) No. of days in 1864 = 366.

366 dys. : 1 dy. :: \$106.14 : amount required.

$\therefore$ Amount required $= \dfrac{10614 \times 1}{366}$ cts. = 29 cts.

(10) 1 ml. : 20 mls. 5 fur. 22 yds. :: \$393·75 : req^d. cost.

$\therefore$ Required cost $= \$\dfrac{393.75 \times 35222}{1760} = \$8126.01\frac{9}{16}$.

(11) \$133.12 : \$449.28 :: 6 cwt. 2 qrs. : weight req^d.

$\therefore$ Required weight $= \dfrac{26 \times 44928}{13312}$ qrs. $= 87\frac{3}{4}$ qrs. = 21 cwt. 3 qrs. 18 lbs. 12 oz.

(12) \$32.15 : \$286.66½ :: \$183·75 : value required.

$\therefore$ Value required $= \$\dfrac{183\ 75 \times 28666\frac{1}{2}}{3215} = \$1638.40\frac{5235}{12860}$.

(13) \$10000 : \$3875 :: \$1 : dividend on \$1.

$\therefore$ Dividend $= \$\dfrac{3875 \times 1}{10000} = \cdot 3875 = 38\frac{3}{4}$ cts.

$\therefore$ Each creditor will lose in \$1, \$1 $-$ 38¾ cts. = 61¼ cts.

(14) 60 men : 84 men :: 5 months : time required.

$\therefore$ Time required $= \dfrac{85 \times 5}{60}$ mos. = 7 mos. 7 mos. $-$ 5 mos. = 2 months.

(15) 1134 yds. : 5313 yds. :: 3s. 4½d. : value req^d.

$\therefore$ Value req^d. $= \dfrac{5313 \times 81}{1134}$ half pence = 15s. 9¾d.

(16) £1 : 17s. 6d. :: £3057 12s. : value required.

$\therefore$ Value of effects $= \dfrac{210 \times 61152}{240}$ s. = £2675 8s.

(17) 10 ft. 8 in. : 1 mi. 1280 yds. :: 4 steps : required number of steps.

$\therefore$ No. required $= \dfrac{109440 \times 4}{128}$ steps = 3420 steps.

(18) 31 ac. 3 ro. 9 po. 21 yds. : 49 ac. 3 ro. 38 po. 2¾ yds. :: £3025 12s. 4½d. : required price.

$\therefore$ Req^d. price $= \dfrac{967769 \times 1452297}{615853}$ half pence = £4754 10s. 10½d.

(19) Loss on \$1 = \$1−59 cts. = 41 cts.
\$1 : \$13675 :: 41 cts. : required loss.

$$\therefore \text{ Loss} = \frac{13675 \times 41}{1} \text{ cts.} = \$5606{\cdot}75.$$

(20) 6 mi. : 10 mi. :: 1 hr. : time req^{d}. by 1st boy, $\therefore$ time required $= \frac{10 \times 1}{6}$ hrs. = 1 hr. 40 min.; also 7½ mi. : 10 mi. :: 1 hr. : time required by 2nd boy, $\therefore$ time required $= \frac{10 \times 1}{7\frac{1}{2}}$ hrs. = 1 hr. 20 min.

Therefore since 1 hr. 40 min. − 1 hr. 20 min. = 20 min. the first boy must start 20 minutes before second boy.

(21) 55 yds. : ½ mi. :: 5 ft. : required gain.

$$\therefore \text{ Required gain} = \frac{880 \times 5}{55} \text{ ft.} = 80 \text{ ft.} = 26 \text{ yds. } 2 \text{ ft.}$$

(22) 45 cts. : 55 cts. :: 36 doz. pairs : required no. of pairs.

$$\therefore \text{ Required no.} = \frac{36 \times 55}{45} \text{ doz.} = 44 \text{ doz.} = 528 \text{ pairs.}$$

(23) 168 dys. : 266 dys. :: 108 men : required no. of men.

$$\therefore \text{ Required no.} = \frac{266 \times 108}{168} \text{ men} = 171 \text{ men.}$$

(24) \$12571.87½ : \$1 :: \$419.06¼ : rate per \$.

$$\therefore \text{ Rate per } \$ = \$\frac{419.06\frac{1}{2} \times 1}{12571.87\frac{1}{2}} = 3\tfrac{1}{3} \text{ cts.}$$

Also, \$1 : \$1734.37½ :: 3⅓ cts. : required payment.

$$\therefore \text{ Req}^{d}\text{. payment} = \$\frac{346875 \times 3\frac{1}{3}}{200} \text{ cts.} = \$57{\cdot}812\tfrac{1}{2}.$$

(25) Number of days in 1863 = 365.
Yearly expenditure = \$2500 − \$994.37½ = \$1505.62½.
365 dys. : 1 dy. :: \$1505.62½ : average daily expenditure.

$$\text{Req}^{d}\text{. expenditure} = \$\frac{1505.62\frac{1}{2} \times 1}{365} = \$4.12\tfrac{1}{2}.$$

(26) 20 dys. : 27 dys. :: 100 men : req^{d}. no. of men.

∴ Req^{d}. no. of men$=\frac{27\times 100}{20}$ men $=135$ men.

(27) 44 ft. : 109 miles :: 1 sec. : time req^{d}. by train.

∴ Time required $=\frac{575520\times 1}{44}$ sec. $=13080$ sec. $=3$ hrs. 38 min.; 8 hrs. + 3 hrs. 38 min. = 11 hrs. 38 min.

(28) 22 cts. : \$1718.75 :: \$1 : amount of debt.

∴ Required am^{t}.$=\frac{171875\times 100}{22}$ cts. = \$7812.50.

Also, his amount of indebtedness to first creditor will be \$7812.50 − (\$1250 × 2 + \$816 × 3) = \$7812.50 − \$4948 = \$2864.50.

Then \$1 : \$2864.50 :: 22 cts. : what first creditor will receive.

∴ 1st cr. will receive $\frac{286450\times 22}{100}$ cts. = \$630·19, and will therefore lose \$2864.50 − \$630.19 = \$2234.31.

(29) 42s. : 70s. :: $4\frac{1}{2}$d. : required cost.

∴ Req^{d}. cost$=\frac{70\times 9}{42}$ half pence $=7\frac{1}{2}$d.

(30) 5 men + 5 boys = 5 men + 3 men = 8 men.

10 men : 8 men :: 15 days : time required.

∴ Time required $=\frac{8\times 15}{10}$ days = 12 days.

(31) 1 lb. 10 oz. 10 dwts. : 1 oz. :: £6 3s. 9d. : req^{d}. 4th term.

∴ 4th proportional $=\frac{20\times 1485}{450}$ d. = 5s. 6d.

(32) Expenditure for the year will be \$2034.50 − \$250 = \$1784.50. Also, the year 1864 contains 366 days, and January 31 days.

366 days : 31 days :: \$1784·50 : req^{d}. expenditure.

∴ Req^{d}. expenditure $=\frac{31\times 1784.50}{366}=\$151.14\frac{113}{183}$.

(33) £1 − 6d. = 19s. 6d.

19s. 6d. : £1 :: £877 10s. : original income.

$\therefore$ Original income $= \dfrac{240 \times 17550}{234}$ s. = £900.

(34) (1) 7d. : £29 3s. 4d. :: £1 : required income.

$\therefore$ Req^d. income $= £\dfrac{7000 \times 1}{7} = £1000.$

(2) £1 − 7d. = 19s. 5d.

19s. 5d. : £1 :: £932 : required income.

$\therefore$ Req^d. income $= £\dfrac{240 \times 932}{233} = £960.$

(35) Weight of gold = (£150 ÷ £3 17s. $10\frac{1}{2}$d.) oz = $38\frac{978}{1869}$ oz.

1 lb. : $38\frac{978}{1869}$ oz. :: 54s. 6d. : required value.

$\therefore$ Req^d. val^l. $= \dfrac{\frac{72000}{1869} \times 654}{12}$ d. $= \dfrac{72000 \times 654}{1869 \times 12}$ d. $= \dfrac{1308000}{623}$ d. $= 2099\frac{1}{2}$d. $\frac{46}{623}$q. = £3 14s. $11\frac{1}{2}$d. $\frac{46}{623}$q.

(36) If 25 men can finish the work in 16 days, 1 man in 1 day will do $\dfrac{1}{16 \times 25} = \frac{1}{400}$ of the work. If all the men work for 4 days they will do $\frac{1}{4}$ of the whole work. $\therefore$ $\frac{3}{4}$ remain to be done.

Then $\frac{1}{400}$: $\frac{3}{4}$ :: 1 man : no. that would finish it in 1 day. $\therefore$ No. req^d $= \dfrac{\frac{3}{4} \times 1}{\frac{1}{400}} = \dfrac{3 \times 1 \times 400}{4} = 300$ men, and therefore 10 men can finish it in 30 days.

(37) 1 ct. + $1\frac{1}{2}$ cts. = $2\frac{1}{2}$ cts. \$1 − $2\frac{1}{2}$ cts. = $97\frac{1}{2}$ cts.

$97\frac{1}{2}$ cts. : \$1 :: \$1855 : required income.

$\therefore$ Req^d. income $= \$\dfrac{1855 \times 100}{97\frac{1}{2}} = \$1902.56\frac{16}{39}.$

(38) $\frac{6}{7}$ qrs. : $\frac{4}{9}$ bus. :: 54s. : required price.

$\therefore$ Req^d. price $= \dfrac{\frac{4}{9} \times 54}{\frac{6}{7} \times 8} = \dfrac{4 \times 54 \times 7}{6 \times 9 \times 8}$ s. = 3s. 6d.

(39) $\frac{13}{15}$ cwt. : $\frac{6}{11}$ ton :: £7 3s. : required price.

$\therefore$ Req^d. price $= \dfrac{\frac{6}{11} \times 20 \times 143}{\frac{13}{15}}$ s. $= \dfrac{6 \times 20 \times 143 \times 15}{11 \times 13}$ s. = £90.

(40) $1\frac{3}{50}$d. : £1 6s. 6d. :: $\frac{1}{192}$ of $\frac{2}{3}$ of $2\frac{1}{2}$ of 4 lbs : required number of lbs.

$$\therefore \text{Req}^{\text{d}}.\text{ no. of lbs.} = \frac{\frac{1}{192} \times \frac{2}{3} \times 2\frac{1}{2} \times 40 \times 318}{1\frac{3}{50}}\text{ lbs.} = 104\tfrac{1}{6}$$

lbs. = 104 lbs. $2\frac{2}{3}$ oz.

(41) From 6 A. M. on Sunday till Tuesday noon are 54 hours, and till 1 P. M. on Saturday the clock will indicate 151 hours.

∴ 54 hrs. 24 min. : 151 hrs. :: 24 min. : gain on true time.

$$\therefore \text{Gain on true time} = \frac{151 \times 60 \times 24}{3264}\text{ min.} = 66\tfrac{21}{34}\text{ min.,}$$

∴ true time will be 1 P. M. − $66\frac{21}{34}$ min. = 11·$53\frac{13}{34}$ A. M.

(42) While hour hand travels 5 minutes, minute hand travels 60 minutes, ∴ the minute hand gains 55 minutes per hour.

∴ 55 min. : 1 hour :: 60 min. : time required.

$$\therefore \text{Time req}^{\text{d}} = \frac{60 \times 60}{55} = 65\tfrac{5}{11}\text{ min.} = 1\text{ hour }5\tfrac{5}{11}\text{ min.}$$

(43) 5 lbs. : ·0625 cwt. :: ·0703125 of \$4 : req$^{\text{d}}$. price.

$$\therefore \text{Req}^{\text{d}}.\text{ price} = \$\frac{\cdot 0703125 \times 4 \times \cdot 0625 \times 20}{5} = \$\cdot 3515625$$

= 35·15625 cts.

(44) 1 man = $\frac{9}{4}$ boys; 1 woman = $\frac{9}{7}$ boys; ∴ 5 men = $\frac{45}{4}$ boys; 4 women = $\frac{36}{7}$ boys; therefore 5 men, 4 women and 2 boys = $(\frac{45}{4} + \frac{36}{7} + 2)$ boys = $18\frac{11}{28}$ boys.

∴ $18\frac{11}{28}$ boys : 9 boys :: 18 days : no. required; ∴ required number of days = $\frac{28}{515} \times 9 \times 18 = 8\frac{416}{515}$.

(45) If $\frac{3}{5}$ of the estate be sold, the rem$^{\text{r}}$. will be $\frac{2}{5}$.

$\frac{1}{3}$ of $\frac{7}{9}$ of $\frac{2}{5}$: $\frac{2}{3}$ :: $1\frac{1}{6}$ of $\frac{8}{9}$ of £$600\frac{8}{9}$: required price.

$$\therefore \text{Required price} = £\frac{\frac{7}{6}\text{ of }\frac{8}{9}\text{ of }600\frac{8}{9} \times \frac{2}{3}}{\frac{1}{3}\text{ of }\frac{7}{9}\text{ of }\frac{2}{5}} = £\frac{623 \times \frac{2}{3}}{\frac{14}{135}} =$$

$$£\frac{623 \times 2}{14 \times 3} = £4005.$$

(46) 1 oz. : $2{\cdot}68\dot{3}$ lbs. :: £$4{\cdot}0\dot{9}$: required price.

∴ Required price $=$ £$4{\cdot}0\dot{9} \times 2{\cdot}68\dot{3} \times 12 =$ £$4\frac{1}{10} \times 2\frac{41}{60} \times 12 =$ £$\frac{41 \times 161 \times 12}{10 \times 60} =$ £$132\frac{1}{50} =$ £132 0s. $4\frac{3}{4}$d. $\frac{1}{5}$q.

(47) 7 dys. : 1 dy. :: \$22.12 : amount earned by 4 men and 5 boys per day; ∴ amount of earnings $=$ \$$\frac{22.12 \times 1}{7} =$ \$3.16.

Also, 9 dys. : 1 dy. :: \$28.98 : amount earned by 3 men and 5 boys per day; ∴ amount $=$ \$$\frac{28.98 \times 1}{9} =$ \$3.22.

And if 4 men and 5 boys earn \$3.16 per day, 12 men and 15 boys will earn \$9.48 per day; similarly, if 3 men and 8 boys earn \$3.22 per day, 12 men and 32 boys will earn \$12.88 per day; or, 12 men and 32 boys will earn \$3.40 more than 12 men and 15 boys; ∴ the \$3.40 must have been earned by the extra 17 boys.

Then 17 boys : 1 boy :: \$3.40 : amount of a boy's earnings per day; ∴ amount $=$ \$$\frac{3.40 \times 1}{17} =$ 20 cts.

Now if 4 men and 5 boys earn \$3.16 per day, 4 men working alone will earn \$3.16 – \$1 (the earnings of 5 boys), or 4 men will earn \$2.16, or 1 man will earn 54 cts; ∴ a man and a boy will together earn (54 + 20) cts. per day $=$ 74 cts.; ∴ 12 men and 12 boys will together earn (74 × 12) cts. $=$ \$8.88 per day.

Then \$8.88 : \$186.48 :: 1 day : req^{d}. no. of days.

∴ Required no. $= \frac{186{\cdot}48 \times 1}{8{\cdot}88}$ days $=$ 21 days.

(48) If *A* completes the work in 5 hrs., in 1 hr. he will do $\frac{1}{5}$ of it; ∴ 1 hr. : 40 min :: $\frac{1}{5}$: amount of work that *A* performs; ∴ amount that *A* performs $=$ $\frac{40 \times \frac{1}{5}}{60} = \frac{2}{15}$.

Also, if *B* can finish the work in 9 hrs., in 1 hr. he will do $\frac{1}{9}$; ∴ 1 hr. : $1\frac{1}{2}$ hrs. :: $\frac{1}{9}$: amount that *B* performs; ∴ amt. that B performs $= \dfrac{\frac{1}{9} \times 1\frac{1}{2}}{1} = \frac{1}{6}$.

$1 - (\frac{2}{15} + \frac{1}{6}) =$ amount remaining to be done $= \frac{7}{10}$.
Also, if C can perform the work in 15 hrs., in 1 hr. he will do $\frac{1}{15}$; ∴ $\frac{1}{15} : \frac{7}{10} ::$ 1 hr. : time required by C to finish the remainder.

∴ Time required $= \dfrac{\frac{7}{10} \times 1}{\frac{1}{15}}$ hours $= 10\frac{1}{2}$ hours.

(49) (1500 + 700) men : 1500 men :: 11 months. : time required to consume the remaining provisions.

∴ Time required $= \dfrac{1500 \times 11}{2200}$ mos. $= 7\frac{1}{2}$ mos., which, added to the 2 months during which the 1500 men had been consuming the provisions, gives $9\frac{1}{2}$ months.

(50) The first travels $4\frac{1}{2}$ miles per hr., and the second 3 miles per hr., therefore they together travel $7\frac{1}{2}$ miles per hour. ∴ $7\frac{1}{2}$ miles : 30 mls. :: 1 hr. : no. of hrs. in which they will meet.

∴ No. of hrs. $= \dfrac{30 \times 1}{7\frac{1}{2}}$ hrs. $= 4$ hrs.; and 8.30 A. M. + 4 hrs. = 12.30 P. M.
Also, $7\frac{1}{2}$ miles : $4\frac{1}{2}$ miles :: 30 miles : distance first travels.

∴ Distance $= \dfrac{30 \times 4\frac{1}{2}}{7\frac{1}{2}} = 18$ mls. *i.e.* 12 mls. from Whitby, or 10 miles from the given place.

(51) The 2 trains together go (24 + 27) miles = 51 miles per hour; the length of the 2 trains is (210 + 180) feet = 390 feet.
Therefore, 51 miles : 390 feet :: 1 hr. : reqd. time.

∴ Required time $= \dfrac{390 \times 60 \times 60}{51 \times 5280}$ sec. $= 5\frac{40}{187}$ sec.

Ex. LXVII. (p. 121.)

(1) $\left.\begin{matrix} 10 : 15 \\ 9 : 12 \end{matrix}\right\}$ :: 4 weeks : no. of weeks required.

∴ No. of weeks reqd $= \dfrac{4 \times 15 \times 12}{10 \times 9}$ weeks $= 8$ wks.

(2) $\left.\begin{array}{r} 1 : 2 \\ 27 : 36 \end{array}\right\} :: 42 \text{ men} : \text{required number of men.}$

$\therefore$ Required number $= \dfrac{42 \times 36 \times 2}{27 \times 1} = 112$ men.

(3) $\left.\begin{array}{r} 135 : 60 \\ 1 : 4 \end{array}\right\} :: 36 \text{ dys.} : \text{required number of dys.}$

$\therefore$ Req^{d}. no. of days $= \dfrac{36 \times 4 \times 60}{135 \times 1}$ days $= 64$ days.

(4) $\left.\begin{array}{r} 104 : 102 \\ 34 : 122 \end{array}\right\} :: \$87.36 : \text{required cost.}$

$\therefore$ Required cost $= \$\dfrac{87.36 \times 122 \times 102}{34 \times 104} = \$307.44.$

(5) $\left.\begin{array}{r} \$100000 : \$1500000 \\ 3 : 7 \end{array}\right\} :: \$2500 : \text{required gain.}$

$\therefore$ Required gain $= \$\dfrac{2500 \times 7 \times 1500000}{3 \times 100000} = \$87500.$

(6) $\left.\begin{array}{r} 7 : 21 \\ \$2.80 : 4.06 \end{array}\right\} :: 40 \text{ miles} : \text{required no. of miles.}$

$\therefore$ Req^{d}. no. of mls. $= \dfrac{40 \times 4.06 \times 21}{2.80 \times 7} = 174$ miles.

(7) $\left.\begin{array}{r} 7 : 45 \\ 20 : 9 \end{array}\right\} :: \$70 : \text{required cost.}$

$\therefore$ Required cost $= \$\dfrac{70 \times 9 \times 45}{20 \times 7} = \$202.50.$

(8) $\left.\begin{array}{r} 24 : 16 \\ 560 : 1200 \end{array}\right\} :: 140 \text{ horses} : \text{req}^{d}\text{. no. of horses.}$

$\therefore$ Req^{d}. no. $= \dfrac{140 \times 1200 \times 16}{560 \times 24}$ horses $= 200$ horses.

(9) $\left.\begin{array}{r} \$\ 250 : \$\ 625 \\ \$2000 : \$5000 \end{array}\right\} :: 16 \text{ months} : \text{req}^{d}\text{. no. of mos.}$

$\therefore$ Req^{d}. no. of mos. $= \dfrac{16 \times 5000 \times 625}{2000 \times 250} = 100$ months.

(10) $\left.\begin{array}{r} 1878 : 22536 \\ 336 : 112 \end{array}\right\} :: 702 \text{ qrs.} : \text{req}^{d}\text{. no. of qrs.}$

$\therefore$ Req^{d}. no. of qrs. $= \dfrac{702 \times 112 \times 22536}{336 \times 1878} = 2808$ qrs.

(11) $\left.\begin{array}{r} 6 : 24 \\ 4 : 2\frac{1}{4} \end{array}\right\}$ :: $17\frac{1}{2}$ acres : required no. of acres.

$\therefore$ Req^d. no. of ac. $=\dfrac{17\frac{1}{2}\times 2\frac{1}{4}\times 24}{4\times 6}=39$ ac. 1 ro. 20 po.

(12) $\left.\begin{array}{rr} £240 : & £234 \\ 91 : & 49 \\ 56 : & 48 \end{array}\right\}$ :: 20 months : req^d. no of mos.

$\therefore$ Req^d. no. of mos. $=\dfrac{20\times 48\times 49\times 234}{56\times 91\times 240}=9$ months.

(13) $\left.\begin{array}{l} 100{\cdot}8 \text{ lbs.} : 5186{\cdot}16 \text{ lbs.} \\ 51{\cdot}45 \text{ dys.} : 3 \text{ dys.} \end{array}\right\}$ :: 20 men : required number of men.

$\therefore$ Req^d. no. of men $=\dfrac{20\times 3\times 5186{\cdot}16}{51{\cdot}45\times 100\,8}=60$ men.

(14) $\left.\begin{array}{r} 1 : \frac{1}{2} \\ \frac{1}{7} : 1 \end{array}\right\}$ :: 26 men : required number of men.

$\therefore$ Req^d. no. $=\dfrac{26\times 1\times \frac{1}{2}}{\frac{1}{7}\times 1}=\dfrac{26\times 1\times 1\times 7}{2}=91$ men.

or thus:

$\left.\begin{array}{l} 85 \text{ ac.} : 42\frac{1}{2} \text{ ac.} \\ 1\frac{5}{7} \text{ dys} : 12 \text{ dys.} \end{array}\right\}$ :: 26 men : req^d. number of men.

$\therefore$ Req^d. no. of men $=\dfrac{26\times 12\times 42\frac{1}{2}}{1\frac{5}{7}\times 85}=91$ men.

(15) $\left.\begin{array}{ll} 16 \text{ men} : & 3 \text{ men} \\ 1 : & 2 \\ 9 : & 10 \end{array}\right\}$ :: 6 dys. : req^d. no. of men.

$\therefore$ Req^d. no. of men $=\dfrac{6\times 10\times 2\times 3}{9\times 1\times 16}=2\frac{1}{2}$ days.

(16) $\left.\begin{array}{ll} 24 & : 16 \\ 18400\text{d.} & : 24840\text{d.} \\ \frac{1}{2} & : 1 \end{array}\right\}$ :: 25 men : req^d. no. of men.

$\therefore$ Required no. of men $=\dfrac{25\times 24840\times 16}{\frac{1}{2}\times 18400\times 24}=45$ men.

(17) $\left.\begin{array}{rr} 6664 : & 798 \\ 57 : & 119 \\ \frac{1}{2} : & 1 \end{array}\right\}$ :: 357 qrs. : required no. of qrs.

$\therefore$ Req^d. no. of qrs. $=\dfrac{357\times 1\times 119\times 798}{\frac{1}{2}\times 57\times 6664}=178\frac{1}{2}$ qrs. $=$ 178 qrs. 4 bus.

$$(18)\quad \left.\begin{array}{rcl}47\cdot5 &:& 3\cdot35\\ 16 &:& 3.20\end{array}\right\} :: \$1.14 : \text{required price per bus.}$$

$$\therefore \text{Required price} = \frac{1\cdot14\times3\cdot20\times3\cdot35}{16\times47\cdot5} = \$1\cdot608.$$

$$(19)\quad \left.\begin{array}{rcl}12 &:& 37\tfrac{1}{2}\\ 25 &:& 4\end{array}\right\} :: \$14.40 : \text{required price.}$$

$$\therefore \text{Required price} = \$\frac{14.40\times4\times37\tfrac{1}{2}}{25\times12} = \$7.20.$$

$$(20)\quad \left.\begin{array}{rcr}6 &:& 4\\ 12 &:& 8\\ 220 &:& 175\\ 35 &:& 36\end{array}\right\} :: 11 \text{ days} : \text{required no. of days.}$$

$$\therefore \text{Req}^{\text{d}}\text{. no. of dys.} = \frac{11\times36\times175\times8\times4}{35\times220\times12\times6} = 4 \text{ days.}$$

$$(21)\quad \left.\begin{array}{rcl}20 &:& 18\\ 135 \text{ in.} &:& 60 \text{ in.}\\ 378 \text{ in.} &:& 168 \text{ in.}\\ 80 &:& 100\end{array}\right\} :: 9 \text{ dys.} : \text{required no. of dys.}$$

$$\therefore \text{Required no.} = \frac{9\times100\times168\times60\times18}{80\times378\times135\times20} = 2 \text{ days.}$$

$$(22)\quad \left.\begin{array}{rcr}5 &:& 3\\ 105 &:& 175\\ 4 &:& 4\tfrac{1}{2}\\ 5 &:& 6\end{array}\right\} :: 10 \text{ days} : \text{required no. of days.}$$

$$\therefore \text{Required no.} = \frac{10\times6\times4\tfrac{1}{2}\times175\times3}{5\times4\times105\times5} \text{ dys.} = 13\tfrac{1}{2} \text{ dys.}$$

$$(23)\quad \left.\begin{array}{rcr}8 &:& 12\\ \$1.26 &:& \$1.80\end{array}\right\} :: 1 \text{ lb. } 11 \text{ oz. } 12 \text{ drs.} : \text{req}^{\text{d}}\text{.w'ght.}$$

$$\therefore \text{Required weight} = \frac{444\times1\cdot80\times12}{1\cdot26\times8} \text{ drs.} = 6660 \text{ drs.}$$

$= 3$ lbs. 11 oz. $7\frac{3}{7}$ drs.

$$(24)\quad \left.\begin{array}{rcr}48 &:& 64\\ 15 &:& 1\\ 22 &:& 825\end{array}\right\} \begin{array}{l}:: 7\tfrac{1}{2} \text{ horses (equivalent to 12 ponies),}\\ \quad : \text{required number of horses.}\end{array}$$

$$\therefore \text{Req}^{\text{d}}\text{. no. of horses} = \frac{7\tfrac{1}{2}\times825\times1\times64}{22\times15\times48} = 25 \text{ horses.}$$

(25) $\left.\begin{array}{rcl} 11 & : & 9 \\ \frac{1}{4} & : & \frac{3}{4} \\ \frac{3}{7} & : & \frac{4}{7} \end{array}\right\}$ :: 55 men : req^{d}. number of men.

$\therefore$ Req^{d}. no. of men $= \dfrac{55 \times \frac{4}{7} \times \frac{3}{4} \times 9}{\frac{3}{7} \times \frac{1}{4} \times 11} = 180$ men.

(26) $\left.\begin{array}{rcr} 15 & : & 5 \\ 10 & : & 15 \\ 12 & : & 5 \\ 1 & : & 4 \end{array}\right\}$ :: 3 feet : required number of feet.

$\therefore$ Required no. of feet $= \dfrac{3 \times 4 \times 5 \times 15 \times 5}{1 \times 12 \times 10 \times 15} = 2\frac{1}{2}$ feet.

Ex. LXVIII. (p. 124.)

(1) 25 cts. = ¼ of $1 | $75.00 = value at $1 each.
2
$150.00 = value at $2 each.
18.75 = value at 25 cts. each.
$168.75 = value at $2.25 each.

(2) 50 cts. = ½ of $1 | $105.00 = value at $1 each.
52.50 = value at 50 cts. each.
$157.50 = value at $1.50 each.

(3) 50 cts. = ½ of $1 | $910.00 = value at $1 each.
455.00 = value at 50 cts. each.
25 cts. = ½ of 50 cts. | 227.50 = value at 25 cts. each.
$1592.50 = value at $1.75 each.

(4) 20 cts. = ⅕ of $1 | $876.00 = value at $1 each.
2
$1752.00 = value at $2 each.
175.20 = value at 20 cts. each.
$1927.20 = value at $2.20 each.

(5) 25 cts. = ¼ of $1 | $1075.00 = value at $1 each.
3
$3225.00 = value at $3 each.
268.75 = value at 25 cts. each.
$3493.75 = value at $3.25 each.

(6) 50 cts. = ½ of $1	$1278.00	= value at $1 each.
	639.00	= value at 50 cts. each.
25 cts. = ½ of 50 cts.	319.50	= value at 25 cts. each.
	159.75	= value at 12½ c. each.
12½ cts. = ½ of 25 cts.	$2396.25	= value at $1.87½ each.

	£	s.	d.	
(7) 1s. = $\frac{1}{20}$ of £1	397	0	0	=value at £1.
	19	17	0	=value at 1s.
	£416	17	0	=value at £1 1s.

	£	s.	d.	
(8) 5s. = ¼ of £1	250	0	0	= value at £1 each.
			2	
2s. 6d = ½ of 5s.	500	0	0	=value at £2 each.
	62	10	0	=value at 5s. each.
6d. = ⅕ of 2s. 6d.	31	5	0	=value at 2s. 6d. each.
	6	5	0	=value at 6d. each.
	£600	0	0	=value at £2 8s. each.

(9) 50 cts. = ½ 1f. $1	$1324.00	=value at $1 each.
	3	
	$3972.00	=value at $3 each.
25 cts. = ½ of 50 cts.	662.00	=value at 50 cts. each.
	331.00	=value at 25 cts. each.
	$4965.00	=value at $3.75 each.

	£	s.	d.	
(10) 5s. = ¼ of £1	2678	0	0	=value at £1 each.
			2	
2s. 6d. = ½ of 5s.	5356	0	0	=value at £2 each.
	669	10	0	=value at 5s. each.
	334	15	0	=value at 2s. 6d. ea.
	£6360	5	0	=va^{l}. at £2 7^{s}. 6^{d}. ea.

	£	s.	d.	
(11) 10s. = ½ of £1	973	0	0	= value at £1 each.
5s. = ½ of 10s.	486	10	0	= value at 10s. each.
1s. = ⅕ of 5s.	243	5	0	= value at 5s. each.
6d. = ½ of 1s.	48	13	0	= value at 1s. each.
2d. = ⅓ of 6d.	24	6	6	= value at 6d. each.
½d. = ¼ of 2d.	8	2	2	= value at 2d. each.
	2	0	6½	= value at ½d. each.
	£812	17	2½	= value at 16s. 8½d.

	£	s.	d.	
(12) 5s. = ¼ of £1	236	0	0	= value at £1 each.
			7	
10d. = ⅙ of 5s.	1652	0	0	= value at £7 each.
1d. = $\frac{1}{10}$ of 10d.	59	0	0	= value at 5s. each.
½d. = ½ of 1d.	9	16	8	= value at 10d. each.
		19	8	= value at 1d. each.
		9	10	= value at ½d. each.
	£1722	6	2	= val. at £7 5s. 11½d.

	£	s.	d.	
(13) 10s. = ½ of £1	9978	0	0	= value at £1 each.
			8	
3s. 4d. = ⅓ of 10s.	79824	0	0	= value at £8 each.
4d. = $\frac{1}{10}$ of 3s. 4d.	4989	0	0	= value at 10s. each.
½ = ⅛ of 4d.	1663	0	0	= val. at 3s. 4d. each.
	166	6	0	= value at 4d. each.
	20	15	9	= value at ½d. each.
	£86663	1	9	= value at £8 13s. 8½d.

	£	s.	d.	
(14) 10s. = ½ of £1	15739	0	0	= val. at £1 each.
6s. 8d. = ⅓ of £1			9	
1s. = $\frac{1}{10}$ of 10s.	141651	0	0	= val. at £9 each.
1d. = $\frac{1}{12}$ of 1s.	7869	10	0	= val. at 10s. each.
½d. = ½ of 1d.	5246	6	8	= val. at 6s. 8d. ea.
¼d. = ½ of ½d.	786	19	0	= val. at 1s. each.
	65	11	7	= val. at 1d. each.
	32	15	9½	= val. at ½d. each.
	16	7	10¾	= val. at ¼d. each.
	£155668	10	11¼	= val. at £9 17s. 9¾d.

(15) 50 cts.=½ of $1	$27835.00	=value at $1 each.
	9	
12½ cts.=¼ of 50 cts.	$250515 00	=value at $9 each.
	13917 50	=val. at 50 cts. each.
	3479 37½	=val. at 12½ c. each.
	$267911.87½	=val. at $9.62½ each.

(16) 50 cts.=½ of $1	$37832.00	=value at $1 each.
	18	
20 cts.=⅕ of $1	$680976.00	=value at $18 each.
	18916 00	=val. at 50 cts. each.
20 cts.=⅕ of $1	7566.40	=val. at 20 cts. each.
	7566.40	=val. at 20 cts. each.
	$715024.80	=val. at $18.90 each.

(17) 20 cts.=⅕ of $1	$250215 00	=value at $1
	50043.00	=value at 20 cts.
5 cts.=¼ of 20 cts.	12510 75	=value at 5 cts.
	10008.60	=value at 4 cts.
4 cts.=⅕ of 20 cts.	$72562.35	=value at 29 cts.

(18) 50 cts.=½ of $1	$12815.00	=value at $1.
	6407.50	=value at 50 cts.
25 cts.=½ of 50 cts.	3203.75	=value at 25 cts.
	$9611.25	=value at 75 cts.

	£	s.	d.	
(19) 10s.=½ of £1	4970	0	0	=value at £1.
1s.=⅒ of 10s.	2485	0	0	=value at 10s.
	248	10	0	=value at 1s.
1d.=$\frac{1}{12}$ of 1s.	20	14	2	=value at 1d.
½d.=½ of 1d.	10	7	1	=value at ½d.
	£2764	11	3	=value at 11s. 1½d.

			d.	
(20) ½d.=½ of 1d.			83	=value at 1d. per yd.
			11	
	£3	16	1	=value at 11d. per yd.
		3	5½	=value at ½d. per yd.
	3	19	6½	=value at 11½d. per yd.
½ of 11½ =			5¾	
	£4	0	0¼	=value of 83½ yds.

	£	s.	d.	
6d. = ½ of 1s.	2	17	0	=value at 1s. per yd.
	1	8	6	=value at 6d. per yd.
4d. = ⅓ of 1s.		19	0	=value at 4d. per yd.
	5	4	6	=value at 1s. 10d. per yd.
¾ of 1s. 10d. =		1	4½	
	£5	5	10½	=value of 57¼ yds.

	s.	d.	
¾d. = 1/12 of 9d.	9	10	=value at 1d. per yd.
		9	
	4 8	6	=value at 9d. per yd.
	7	4½	=value at ¾d. per yd.
	£4 15	10½	=value at 8¾d. per yd.

£	s.	d.	
4	0	0¼	
5	5	10½	
4	15	10½	
£14	1	9¼	= total amount.

Ex. LXIX. (p. 126.)

(1) 20 lbs. = ⅓ of 1 bus.	$1.20	=value of 1 bushel.
	55	
	$66.00	=value of 55 bushels.
	40	=value of 20 lbs.
5 lbs. = ¼ of 20 lbs.	10	=value of 5 lbs.
	$66.50	=value of 55 b. 25 lbs.

	10 cts.	=value of 1 lb.,
(2) 2 qrs. = ½ of 1 cwt.	∴ $10.00	=value of 1 cwt.
	16	
	$160.00	=value of 16 cwt.
	5.00	=value of 2 qrs.
10 lbs. = ⅕ of 2 qrs.	1.00	=value of 10 lbs.
10 lbs. = ⅕ of 2 qrs.	1.00	=value of 10 lbs.
	$167.00	=value of 16 cwt. 2 qrs. 20 lbs.

(3) 2 ro.=$\frac{1}{2}$ of 1 ac.	$15.50	=value of 1 ac.
	8	
	$124.00	=value of 8 ac.
	12	
	$1488.00	=value of 96 ac.
10 per.=$\frac{1}{5}$ of 2 ro.	7.75	=value of 2 ro.
	·96875	=value of 10 per.
	$1496·71875	=va$^{\text{l}}$. of 96 ac. 2 ro. 10 per.

		s.	d.	
(4) 10 dwt.=$\frac{1}{2}$ of 1 oz.		7	1	=value of 1 oz.
			32	
	£11	6	8	=va$^{\text{l}}$. of 2 lbs. 8 oz.
2 dwt.=$\frac{1}{5}$ of 10 dwt.		3	6$\frac{1}{2}$	=value of 10 dwt.
1 dwt.=$\frac{1}{2}$ of 2 dwt.			8$\frac{1}{2}$	=value of 2 dwt.
			4$\frac{1}{4}$	=value of 1 dwt.
	£11	11	3$\frac{1}{4}$	=va$^{\text{l}}$. of 2 lbs. 8 oz. 13 dwt.

		s.	d.	
(5) 1 ft. 6 in.=$\frac{1}{2}$ of 1 yd.		12	6	=value of 1 yd.
1 foot=$\frac{1}{3}$ of 1 yard.			15	
	£9	7	6	=value of 15 yds.
1 inch=$\frac{1}{12}$ of 1 foot.		6	3	=va$^{\text{l}}$. of 1 ft. 6 in.
		4	2	=value of 1 ft.
			4$\frac{1}{6}$	=value of 1 in.
	£9	18	3$\frac{1}{6}$	=value of 15 yds. 2 ft. 7 in.

	£	s.	d.	
(6) 72 in.=$\frac{1}{2}$ of 1 s. ft.	1	7	0	=value of 1 s. ft.
		259		
	£349	13	0	=value of 259 s. ft. or 28 s. yds. 7 s. ft.
36 inches=$\frac{1}{2}$ of 72 in.		13	6	=value of 72 in.
2 inches=$\frac{1}{18}$ of 36 in.		6	9	=value of 36 in.
			4$\frac{1}{2}$	=value of 2 in.
	£350	13	7$\frac{1}{2}$	=va$^{\text{l}}$. of 28 s. yds. 7 s. ft. 110 in.

(7) 2 fur. = $\frac{1}{4}$ of 1 mi.	\$11000.00	= value of 1 mile.
	11	
	\$121000.00	= value of 11 mi.
1 fur. = $\frac{1}{2}$ of 2 fur.	2750.00	= value of 2 fur.
	1375.00	= value of 1 fur.
55 yards = $\frac{1}{32}$ of 1 mi.	343.75	= value of 55 yds.
	\$125468.75	= value of 11 miles 3 fur. 55 yds.

(8) $57\frac{1}{2}$ lbs. × 2 = 115 lbs.
$73\frac{3}{4}$ lbs. × 3 = $221\frac{1}{4}$ lbs.

$336\frac{1}{4}$ lbs. = 3 cwt. $36\frac{1}{4}$ lbs.

25 lbs. = $\frac{1}{4}$ of 1 cwt.	\$25.00	= value of 1 cwt.
	3	
	\$75.00	= value of 3 cwt.
10 lbs. = $\frac{1}{10}$ of 1 cwt.	6.25	= value of 25 lbs.
1 lb. = $\frac{1}{10}$ of 10 lbs.	2.50	= value of 10 lbs.
$\frac{1}{4}$ lb. = $\frac{1}{4}$ of 1 lb.	.25	= value of 1 lb.
	$.06\frac{1}{4}$	= value of $\frac{1}{4}$ lb.
	$\$84.06\frac{1}{4}$	= value of 3 cwt. $36\frac{1}{4}$ lbs.

(9) 50 ft. = $\frac{1}{2}$ of 100 ft.	\$5.00	= value per 100 feet.
	34	
	\$170.00	= value of 3400 feet.
10 feet = $\frac{1}{5}$ of 50 feet.	2.50	= value of 50 feet.
	.50	= value of 10 feet.
	\$173.00	= value of 3460 feet.

(10) 500 = $\frac{1}{2}$ of 1000	\$4.00	= value per 1000 bricks.
	24	
	\$96.00	= value of 24000.
100 = $\frac{1}{5}$ of 500	2.00	= value of 500.
50 = $\frac{1}{2}$ of 100	.40	= value of 100.
	.20	= value of 50.
	\$98.60	= value of 24650.

(11) $500 = \frac{1}{2}$ of 1000

$50 = \frac{1}{10}$ of 500.
$25 = \frac{1}{2}$ of 50.
$10 = \frac{1}{5}$ of 50.
$5 = \frac{1}{2}$ of 10.

\$10.25 = value per 1000 ft.
46

\$471.50 = valuc of 46000 ft.
5·125 = value of 500 feet.
·5125 = value of 50 feet.
·25625 ≐ value of 25 feet.
·1025 = value of 10 feet.
·05125 = value of 5 feet.

\$477·54750 = value of 46590 ft.

(12) $19\frac{1}{2}$ cts. = value of 1 yard.
17

\$3.31$\frac{1}{2}$ = value of 17 yards.
$\frac{5}{8}$ of $19\frac{1}{2}$ cts. = $12\frac{3}{16}$

\$3.43$\frac{11}{16}$ = value of $17\frac{5}{8}$ yards.

$55\frac{1}{2}$ cts. = value of 1 yard.
35

\$19.42$\frac{1}{2}$ = value of 35 yards.
$\frac{9}{16}$ of $55\frac{1}{2}$ = $31\frac{7}{32}$

\$19.73$\frac{23}{32}$ = value of $35\frac{9}{16}$ yards.

$70\frac{1}{2}$ cts. = value of 1 yard.
96

\$67.68 = value of 96 yards.
$\frac{8}{11}$ of $70\frac{1}{2}$ cts. = $51\frac{3}{11}$

\$68.19$\frac{3}{11}$ = value of $96\frac{8}{11}$ yards.

$32\frac{1}{2}$ cts. = value 1 yard.
104

\$33.80 = value of 104 yards.
$\frac{5}{6}$ of $32\frac{1}{2}$ cts. = $27\frac{1}{12}$

\$34.07$\frac{1}{12}$ = value of $104\frac{5}{6}$ yards.

$17\frac{1}{4}$ cts. = value of 1 yard.
12

$\frac{3}{8}$ of $17\frac{1}{4}$ cts. =

\$2.07 = value of 12 yards.
$.06\frac{15}{32}$

$\$2.13\frac{15}{32}$ = value of $12\frac{3}{8}$ yards.

$$\begin{array}{r}
\$\ 3.43\frac{11}{16} \\
19.73\frac{23}{32} \\
68.19\frac{3}{11} \\
34.07\frac{1}{12} \\
2.13\frac{15}{32} \\
\hline
\$127.57\frac{61}{264}
\end{array}$$
= total amount.

(13)

$12\frac{1}{2}$ cts. = value of 1 pound.
25

$\frac{13}{15}$ of $12\frac{1}{2}$ =

$\$3.12\frac{1}{2}$ = value of 25 lbs.
$10\frac{5}{6}$

$\$3.23\frac{1}{3}$ = value of $25\frac{13}{15}$ lbs.

11 cts. = value of 1 pound.
19

$\frac{11}{12}$ of 11 =

\$2.09 = value of 19 lbs.
$10\frac{1}{12}$

$\$2.19\frac{1}{12}$ = value of $19\frac{11}{12}$ lbs.

$8\frac{1}{2}$ cts. = value of 1 pound.
35

$\frac{7}{8}$ of $8\frac{1}{2}$ =

$\$2.97\frac{1}{2}$ = value of 35 lbs.
$.07\frac{7}{16}$

$\$3.04\frac{15}{16}$ = value of $35\frac{7}{8}$ lbs.

$6\frac{1}{2}$ cts. = value of 1 pound.
17

$\frac{1}{2}$ of $6\frac{1}{2}$ = 1.10\frac{1}{2}$ = value of 17 lbs.
.03$\frac{1}{4}$

1.13\frac{3}{4}$ = value of $17\frac{1}{2}$ lbs.
3.23\frac{1}{3}$
2.19$\frac{1}{12}$
3.04$\frac{15}{16}$
1.13$\frac{3}{4}$

9.61\frac{5}{48}$ = total amount.

(14) $12\frac{1}{2}$ cts. = value of 1 pound.
17

$\frac{8}{9}$ of $12\frac{1}{2}$ = 2.12\frac{1}{2}$ = value of 17 lbs.
.11$\frac{1}{9}$

2.23\frac{11}{18}$ = value of $17\frac{8}{9}$ lbs.
$17\frac{1}{2}$ cts. = value of 1 pound.
18

$\frac{3}{4}$ of $17\frac{1}{2}$ = $3.15 = value of 18 lbs.
.13$\frac{1}{8}$

3.28\frac{1}{8}$ = value of $18\frac{3}{4}$ lbs.
75 cts. = value of 1 pound.
5

$\frac{5}{18}$ of 75 = $3.75 = value of 5 pound.
.20$\frac{5}{6}$

3.95\frac{5}{6}$ = value of $5\frac{5}{18}$ lbs.
40 cts. = value of 1 pound.
10

$\frac{5}{7}$ of 40 = $4.00 = value of 10 lbs.
.28$\frac{4}{7}$

4.28\frac{4}{7}$ = value of $10\frac{5}{7}$ lbs.

25 cts. = value 1 pound.
7

\$1.75 = value of 7 lbs.
$\frac{3}{4}$ of 25 = $.18\frac{3}{4}$

$\$1.93\frac{3}{4}$ = value of $7\frac{3}{4}$ lbs.
$\$2.23\frac{11}{18}$
$3.28\frac{1}{3}$
$3.95\frac{5}{6}$
$4.28\frac{4}{7}$
$1.93\frac{3}{4}$

$\$15.69\frac{449}{504}$ = total amount.

Ex. LXX. (p. 128.)

(1) \$217.25
8

\$17·3800 = int.
\$17.38 + \$217.25 = \$234.63
= amount.

(3) $\$527.37\frac{1}{2}$
7

\$36·91625
3

\$110·74875 = int.
$\$527.37\frac{1}{2}$ + \$110·74875 =
\$638·12375 = amount.

(4) \$93.50
6

\$5.6100
2

\$11.22 = int.
\$93.50 + \$11.22 = \$104.72
= amount.

(2) \$217.25
8

\$17·3800
2

\$34.76 = int.
\$217.25 + \$34.76 =
\$252.01 = amt.

(5) \$75.75
7

\$5.3025
$5\frac{1}{2}$

\$10.6050
2.65125

\$13·25625 = int.
\$75.75 + \$13·25625 =
\$89·00625 = amt.

(6)
£ s. d.
62 18 9½
8

503 10 4
3½

1510 11 0
251 15 2

£1762 7 2
20

12·47s.
12

5·66d.
4

2·64q.
£17 12s. 5½d. = interest.
£62 18s. 9½d. + £17 12s. 5½d.
= £80 11s. 3d. = amt.

(7)
$1075.75
8

$86·0600
4¼

$344.24
21·515

$365·755 = int.
$1075.75 + $365·755 =
$1441·505 = amt.

(8)
$684.00
8

$54·7200
5

$273.60
12 : 8 :: $54.72 : int. for 8 mos.; $\$\frac{54.72 \times 8}{12} = \$36.48$.
$273.60 + $36.48 = $310.08 = interest.
$684.00 + $310.08 =
$994.08 = amount.

(9)
£7500
3⅛

22500
937.5

£234·375

No. of days from May 5th to October 26th = 174.
365 : 174 :: £234·375 : interest req^d. ∴ Int. req^d. $= £\frac{234·375 \times 174}{365}$;

£234·375
174

937500
1640625
234375

£40781·250, or £40781 5s.;

(Continued on next page.)

£ s. £ s. d.
365 (40781 5 (111 14 $7\frac{5}{73}$ = interest.
365
428
365
631
365
266
20
5325
365
1675

£7500 + £111 14s. $7\frac{5}{73}$d. =
£7611 14s. $7\frac{5}{73}$d. = amt.

1675
1460
215
12
2580
2555
$\frac{25}{365} = \frac{5}{73}$

(10)
£ s. d.
4865 11 5
$5\frac{3}{8}$
24327 17 1
1824 11 $9\frac{3}{8}$
26152 8 $10\frac{3}{8}$ ÷ 100 = £261 10s. 5·86375d.;

Number of days from Jan. 1st to Aug. 28th, 1868 = 240. 366 : 240 :: £261 10s. 5·86375d. : interest req^{d}.

$\therefore$ Interest req^{d}. = £$\frac{261 \text{ 10s. } 5{\cdot}86375\text{d} \times 240}{366}$ = £171 9s. 9·94d. Amount = £4865 11s. 5d. + £171 9s. 9·94d. = £5037 1s. 2·94d.

(11) Interest = amt. − principal = \$994.56 − \$672.00 = \$322.56. Interest on \$672.00 at 8 per cent. for one year = \$53.76.

Hence, \$53.76 : \$322.56 :: 1 year : time required.

$\therefore$ Time required = $\frac{32256 \times 1}{5376}$ years = 6 years.

(12) \$816 : 100 :: $\frac{1}{5}$ of \$346.80 : rate required.

$\therefore$ Rate required = $\frac{69{\cdot}36 \times 100}{816} = 8\frac{1}{2}$.

(13) £100 will amount in 15 months at 5 per cent. to £106 5s. Hence, £106 5s. : £138 2s. 6d. (given amt.) :: £100 : sum required.

∴ Sum required $=\dfrac{100\times 33150}{25500}=$ £130.

	£	fl.	c.	m.
(14)	578	3	1	2·5
				2½
	1156	6	2	50
	289	1	5	625
	14·45	7	8	125
				2¼
	28·91	5	6	250
	3·61	4	4	53125
	£32·53	0	0	78125 = £32 5fl. 3c. 0·078125m.

(15) \$2293.75 : \$100 :: $\frac{1}{25}$ of \$2293.75 : rate reqd.

∴ Rate required $=\dfrac{91{\cdot}75\times 100}{2293{\cdot}75}=4.$

Ex. LXXI. (p. 130.)

(1) $800
7
$56.00 = int. for 1st yr.
∴ $856.00 = 2nd principal.
7
$59.92 = int. for 2nd yr.
∴ Comp. int. = $56.00 + $59.92 = $115.92. Amt. = $800 + $115.92 = $915.92.

(2) $742
8
$59.36 = int. for 1st yr.
∴ $801.36 = 2nd principal.
8
$64.1088 = int. for 2nd yr.
∴ $865.4688 = 3rd principal.
8
$69.237504 = int. for 3rd yr.
∴ Comp. int. = $59.36 + $64.1088 + $69.237504 = $192.70+. Amt. = $742 + $192.70+ = $934.70+.

(3) $560
10

$56.00=in^{t}. for 1st yr.
∴ $616.00=2nd principal.
10

$61.60=in^{t}. for 2nd yr.
∴ $677.60=3rd principal.
10

$67.76=in^{t}. for 3rd yr.
∴ $745.36=4th prin^{l}.
10

$74.536=in^{t}. for 4th yr.
∴ $819.896=5th principal.
10

$81.9896=in^{t}. for 5th year.

$81·9896
$74·536
$67·76
$61·60
$56·00

$341.8856 = comp. in^{t}.,
or $341.88+. Am^{t}.=$341.88
+ $560 = $901.88+.

(4)

1st pay't of int.=$308. × $\frac{1\frac{1}{2}}{100}$= $4.62
2nd pay't of int.=$312·62 × $\frac{1\frac{1}{2}}{100}$= $4·6893
3rd pay't of int.=$317·3093 × $\frac{1\frac{1}{2}}{100}$= $4·7596395
4th pay't of int.=$322·1689395 × $\frac{1\frac{1}{2}}{100}$= $4·8335340925
5th pay't of int.=$327·0024735925 × $\frac{1\frac{1}{2}}{100}$= $4·9050371088875
6th pay't of int.=$331·9075107013875 × $\frac{1\frac{1}{2}}{100}$= $4·9786126605208125

∴ Comp. interest=$28.7861233619083125
or, $28.78+.

∴ Amount = $308.00 + $28.78 + = $336.78+.

(5)

1st pay't of interest = \$610. $\times\frac{4}{100}=$ \$24·40
2d pay't of interest = \$634·40 $\times\frac{4}{100}=$ \$25·376
3d pay't of interest = \$659·776 $\times\frac{4}{100}=$ \$26·39104
4th pay't of interest = \$686·16704 $\times\frac{4}{100}=$ \$27·4466816

∴ Comp. interest = \$103·6137216
\$610·00

Amount = \$713·61+.

(6)

1st pay't of int. = \$1000. $\times\frac{3\frac{1}{2}}{100}=$ \$35.
2d pay't of int. = \$1035. $\times\frac{3\frac{1}{2}}{100}=$ \$36·225
3d pay't of int. = \$1071·225 $\times\frac{3\frac{1}{2}}{100}=$ \$37·492875
4th pay't of int. = \$1108·717875 $\times\frac{3\frac{1}{2}}{100}=$ \$38·805125625
5th pay't of int. = \$1147·523000625 $\times\frac{3\frac{1}{2}}{100}=$ \$40·163305021875
6th pay't of int. = \$1187·686305584375 $\times\frac{3\frac{1}{2}}{100}=$ \$41·56902070453125

∴ Comp. interest = \$229·25532635140625
or. \$229·25 +.

Amount = \$1000 + 229.25 ... = \$1229.25...

(7)

(1) £880
$3\frac{1}{2}$
2640
440
£30·80
2
£61·60 = simple int.

£62·678
£61·60
£1.078
20
1·560s.
12
6·72d.
4
2·88q.

£1 1s. $6\frac{1}{2}$d. ·88q.

(Continued on next page.)

(7 continued.)

(^{1}) £880
3½
£30·8 = int. for 1st yr.
∴ £910·8 = 2d principal.
3½
£31·878=int. for 2nd yr.
£30·8+£31·878=comp. int.
= £62·678.

(^{2}) £178·7116
171·75
£6·9616
20
19·232s.
12
2·784d.
4
3·136q.

£6 19s. 2¾d. ·136q.

(^{2}) £1431·25
4
£57·2500
3
£171·75 = simp. int.

£1431·25
4
£57·25=int. for 1st yr.
∴ £1488·5 =2d principal.
4
£59·54=int. for 2d yr.
∴ £1548·04=3d principal.
4
£61·9216=int. for 3d yr.
£59·54
£57·25
£178·7116=comp. interest.

Ex. LXXII. (p. 133.)

(1) \$108 : \$216 :: \$100 : present worth.

$$\therefore \text{ Present worth} = \$\frac{100\times 216}{108} = \$200.$$

(2) \$121 : \$968 :: \$100 : present worth.

$$\therefore \text{ Present worth} = \$\frac{100\times 968}{121} = \$800.$$

(3) \$103 : \$1236 :: \$100 : present worth.

$$\therefore \text{ Present worth} = \$\frac{100\times 1236}{103} = \$1200.$$

(4) \$107.50 : \$225.25 :: \$100 : present worth.

$\therefore$ Present worth $= \$\dfrac{100 \times 22525}{10750} = \$209.53+$.

(5) \$117.50 : \$1057.50 : \$100 : present worth.

$\therefore$ Present worth $= \$\dfrac{100 \times 105750}{11750} = \$900$.

(6) £125 : £161 13s. 5¼d. :: £100 : present worth.

$\therefore$ Present worth $= £\dfrac{100 \times 155205}{120000} = £129$ 6s. 9d.

(7) £107 18s. 4d. : £193 17s. 4¼d. :: £100 : present worth.

$\therefore$ Present worth $= £\dfrac{100 \times 186113}{103600} = £179$ 12s. $10\frac{3}{4}$d. $\frac{233}{259}$q.

(8) £100 8s. $5\frac{67}{73}$d. : £458 8s. 9¼d. :: £100 : present worth.

$\therefore$ Present w'th $= £\dfrac{100 \times \frac{440101}{4}}{\frac{1759440}{73}} = £\dfrac{440101 \times 100 \times 73}{4 \times 1759440}$
$= £456$ 9s. $11\frac{3}{4}$d. $\frac{7191}{7331}$q.

(9) \$124 : \$217 :: \$24 : discount.

$\therefore$ Discount $= \$\dfrac{217 \times 24}{124} = \$42$.

(10) \$110.50 : \$221 :: \$10.50 : discount.

$\therefore$ Discount $= \$\dfrac{1050 \times 221}{11050} = \$2100$.

(11) \$105 : \$2000 :: \$5 : discount.

$\therefore$ Discount $= \$\dfrac{5 \times 2000}{105} = \$95.23\frac{17}{21}$.

(12) \$106 : \$1750 :: \$6 : discount.

$\therefore$ Discount $= \$\dfrac{6 \times 1750}{106} = \$99.05\frac{35}{53}$.

(13) £100 18s. $10\frac{14}{73}$d : £345 16s. 3d. :: 18s. $10\frac{14}{73}$d : discount.

$\therefore$ Dis't$=\dfrac{\frac{16512}{73}\times\frac{6058635}{73}}{\frac{1768512}{73}}$d.$=\dfrac{16512\times6058635\times73}{73\times73\times1768512}$d.$=\frac{7137570}{9211}$d.$=$£3 4s. $6\frac{3}{4}$d. $\frac{5391}{9211}$q.

(14) £$100\frac{32}{73}$: £549 :: £$\frac{32}{73}$: discount.

$\therefore$ Discount$=$£$\dfrac{\frac{40077}{73}\times\frac{32}{73}}{\frac{7332}{73}}=$£$\dfrac{40077\times32\times73}{7332\times73\times73}=$£2 7s. 11d. $\frac{140}{611}$q

Also, £100 : £549 :: £$\frac{32}{73}$: interest on £549.

$\therefore$ Interest $=$ £$\dfrac{549\times32}{100\times73}=$£2 8s. $1\frac{1}{2}$d. $\frac{114}{365}$q.

£2 8s. $1\frac{1}{2}$d. $\frac{114}{365}$q $-$£2 7s. 11d. $\frac{140}{611}$q.$=2\frac{1}{2}$d.$\frac{18554}{223015}$q.

(15) £$100\frac{45}{73}$: £450 :: £$\frac{45}{73}$: discount.

$\therefore$ Discount$=$£$\dfrac{\frac{32850}{73}\times\frac{45}{73}}{\frac{7345}{73}}=$£$\dfrac{32850\times73\times45}{7345\times73\times73}=$£2 15s. $1\frac{991}{1469}$d.

Also, £100 : £450 :: £$\frac{45}{73}$: interest.

$\therefore$ Interest $=$ £$\dfrac{450\times45}{100\times73}=$£2 15s. $5\frac{55}{73}$d.

£2 15s. $5\frac{55}{73}$d.$-$£2 15s. $1\frac{991}{1469}$d.$=4\frac{8452}{107237}$d.

(16) In 18 months the tradesman allows 5s, or 3s. 4d. per year on £3 6s. 8d., that is $\frac{1}{20}$ of the whole.

Then 1 : $\frac{1}{20}$ :: 100 : rate of discount. $\therefore$ Rate $=\dfrac{100\times1}{1\times20}=5$ per cent.

Ex. LXXIII. (p. 137.)

(1) \$126.50 : \$527.25 :: \$100 : amount required.

$\therefore$ Amount req^d.$=\$\dfrac{52725\times100}{12650}=\$416.79+$.

(2) \$102.50 : \$800 :: \$100 : amount required.

$\therefore$ Amount required $=\$\dfrac{800\times100}{102.50}=\$780.48\frac{32}{41}$.

(3) \$100 : \$1556 :: \$98 : required value.

$$\therefore \text{ Value} = \$\frac{98 \times 1556}{100} = \$1524.88.$$

(4) \$99 : \$525.50 :: \$7 : required income.

$$\therefore \text{ Required income} = \$\frac{52550 \times 7}{99} = \$37.15\tfrac{65}{99}.$$

(5) $\$7\frac{1}{2}$: \$900 :: $\$125\frac{23}{40}$: income required.

$$\therefore \text{ Income} = \$\frac{5023 \times 900 \times 2}{15 \times 40} = \$15069.$$

(6) \$100 : \$2140 :: \$65 : amount required.

$$\therefore \text{ Amount required} = \$\frac{65 \times 2140}{100} = \$1391.$$

(7) (1) $\pounds 90\frac{7}{8}$: £666 8s. 3d. :: £3 : gross income.

$$\therefore \text{ Income} = \pounds\frac{666 \text{ 8s. 3d.} \times 3}{90\frac{7}{8}} = \pounds 22.$$

Income tax = (22 × 4)d. = 88d. = 7s. 4d. Net income = £22 − 7s. 4d. = £21 12s. 8d. Half-yearly gain = £21 12s. 8d. ÷ 2 = £10 16s. 4d.

(2) Income tax on £100 = (100 × 4)d. = 400d. = £1 13s. 4d.; ∴ £100 income would yield £100 − £1 13s. 4d. = £98 6s. 8d., or $\pounds 98\frac{1}{3}$. Hence, $\pounds 90\frac{7}{8}$: $\pounds 98\frac{1}{3}$ :: £3 : req^{d}. rate.

$$\therefore \text{ Req}^{\text{d}}\text{. rate} = \pounds\frac{3 \times 98\frac{1}{3}}{90\frac{7}{8}} = \pounds\frac{3 \times 295 \times 8}{3 \times 727} = \pounds 3\ 4^{\text{s}}.\ 11\tfrac{67}{727}{}^{\text{d}}.$$

(8) £136 : £100 :: £8 : required rate.

$$\therefore \text{ Rate required} = \frac{8 \times 100}{136} = 5{\cdot}88 + \text{ or nearly 6 per ct.}$$

(9) £136 : £100 :: £8 : Int. received from *B* of Montreal.

$$\therefore \text{ Rate of Interest} = \frac{100 \times 8}{136} = 5{\cdot}88 +$$

£104 : £100 :: £7.5 : Int. received from *B* of Toronto.

$$\therefore \text{ Rate of Interest} = \frac{7{\cdot}5 \times 100}{104} = 7{\cdot}21 +$$

Therefore the Bank of Toronto is the better investment.

(10) £93 : £4650 :: £100 : quantity of 3 per cent. stock bought.

$\therefore$ Quantity of stock bought $= £\frac{4650 \times 100}{93} = £5000$.

The stock stood at 93: now having fallen $\frac{1}{2}$ per cent., it stands at $92\frac{1}{2}$.

$\therefore$ 100 : 5000 :: £$92\frac{1}{2}$: value of stock.

$\therefore$ Value of stock $= £\frac{5000 \times 92\frac{1}{2}}{100} = £4625$

$\therefore$ Loss of property = £4650 − £4625 = £25.

(11) £$90\frac{5}{8}$: £99 :: £29000 : quantity of 3 per cent. stock.

$\therefore$ Quantity of 3 per cent stock $= £\frac{29000 \times 99 \times 8}{725} =$ £31680.

1st income $= £\frac{29000 \times 3\frac{1}{2}}{100} = £1015$

2d income $= £\frac{31680 \times 3}{100} = £950$ 8s.

$\therefore$ Loss = £1015 − £950 8s. = £64 12s

(12) \$115 : \$2000 :: \$8 : gain.

$\therefore$ Gain $= \$\frac{2000 \times 8}{115} = \$139\frac{3}{23}$.

(13) £100 : £95 :: £5000000 : value of in. £5000000 in 3 per cts.

$\therefore$ Value $= £\,\frac{5000000 \times 95}{100} = £4750000$.

Amount still due = £5016000 − £4750000 = £266000.

£3 : £$3\frac{1}{2}$ :: £95 : value of the $3\frac{1}{2}$ per cents.

$\therefore$ Value $= £\frac{3\frac{1}{2} \times 95}{3} = £110\frac{5}{6}$.

£$110\frac{5}{6}$: £100 :: £266000 : amount of $3\frac{1}{2}$ per cent. stock.

$\therefore$ Amount of $3\frac{1}{2}$ stock $= £\frac{266000 \times 100}{110\frac{5}{6}} = £240000$

(14) £93½ : £18700 :: £3½ : income.

$\therefore$ Income $= £\frac{18700 \times 3\frac{1}{2}}{93\frac{1}{2}} = £700.$

$\frac{1}{5}$ of £18700 = £3740; $\frac{4}{5}$ of £18700 = £14960;

$\therefore$ £96 : £3740 :: £4 : income from 1st investment.

$\therefore$ Income $= £\frac{3740 \times 4}{96} =$ £155 16s. 8d.

£90 : £14960 :: £3 : income from 2d investment.

$\therefore$ Income $= £\frac{14960 \times 3}{90} =$ £498 13s. 4d;

$\therefore$ total income = £155 16s. 8d. + £498 13s. 4d. = £654 10s.

Hence loss = £700 − £654 10s. = £45 10s.

This question may be solved by obtaining the am't of stock in each case and then the incomes.

(15) £91 : £5460 :: £100 : am't of 3 per cent. st'k.

$\therefore$ Amount $= £\frac{100 \times 5460}{91} = £6000.$

£100 : £93½ :: £2000 : produce from 1st sale.

$\therefore$ Produce $= £\frac{2000 \times 93\frac{1}{2}}{100} = £1870.$

£100 : £85 :: £4000 : produce from 2d sale.

$\therefore$ Produce $= £\frac{4000 \times 85}{100} = £3400;$

$\therefore$ total amount realized = £3400 + £1870 = £5720.

£102 : £5720 :: £100 : amount of 4½ per cent. st'k.

$\therefore$ Amount $= £\frac{5720 \times 100}{102} =$ £5166 13s. 4d.

Income from 3 per cent. stock $= £\frac{6000 \times 3}{100} = £180.$

Income from 4½ per ct. st'k $= £\frac{5166 \text{ 13s. 4d.} \times 4\frac{1}{2}}{100} =$ £232 10s.

$\therefore$ Gain = £232 10s. − £180 = £52 10s.

(16) £3 : £350 :: £100 : is to amount invested in 3 per cents.

$\therefore$ Amount invested $= £\frac{100 \times 350}{3} = £11666\frac{2}{3}$.

£100 : £$11666\frac{2}{3}$ :: £$87\frac{1}{4}$: value of 3 per cent. stock.

$\therefore$ Value $= £\frac{349 \times 35000}{100 \times 3 \times 4} = £10179\frac{1}{6}$.

£$104\frac{7}{8}$: £$10179\frac{1}{6}$ :: £5 : income from 5 per cents.

$\therefore$ income from 5 per cents $= £\frac{5 \times 61075 \times 8}{839 \times 6} =$ £485 5s. $11\frac{3}{4}$d. $\frac{807}{839}$q.

£485 5s. $11\frac{3}{4}$d. $\frac{807}{839}$q. $-$ £350 $=$ £135 5s. $11\frac{3}{4}$d. $\frac{807}{839}$q.

Ex. LXXIV. (p. 141.)

(1) \$100 : \$4300 :: \$$\frac{1}{8}$: commission required.

$\therefore$ Commission $= \$\frac{4300 \times \frac{1}{8}}{100} = \$5.37\frac{1}{2}$.

(2) \$100 : \$9626.55 :: \$2.60 : premium required.

$\therefore$ Premium required $= \$\frac{2.60 \times 9626.55}{100} = \$250{\cdot}2903$.

(3) \$1560 stock : \$100 stock :: \$4.60 : per cent.

$\therefore$ Per cent. $= \frac{4.60 \times 100}{1560} = \$\frac{1150}{3900} = 29\frac{19}{39}$ cts. per cent.

(4) \$2.40 : \$100 :: \$45.60 : sum required.

$\therefore$ Sum required $= \$\frac{45.60 \times 100}{2.40} = \$1900$.

(5) 25 yds. × 36 = 900 yds.: 900 yds. at $10\frac{1}{2}$d per yd. $=$ £39 7s. 6d.

(1) £39 7s. 6d. $-$ (£32 16s. 3d. + 6s. 3d.) $=$ £6 5s. $=$ whole gain.

(2) £33 2s. 6d. : £100 :: £6 5s. : required gain per cent.

$\therefore$ gain per cent. $= \frac{24000 \times 125}{7950}$s. $=$ £18 17s. $2\frac{1}{2}$d. $\frac{11}{53}$q.

(6) Cost of 1280 bus. at \$1.20 per bus. = \$1536.00
(¹) $(1280 \times 3\frac{3}{4})$cts. = carriage etc. expenses = \$48.00.
Total expenses = \$1536.00 + \$48.00 = \$1584.00.
1280 bus. at \$1.40 per bushel = \$1792 = selling price.
∴ Gain = \$1792 − \$1584 = \$208;

(²) \$1584 : \$100 :: \$208 : gain per cent.

$$\therefore \text{ Gain per cent.} = \$\frac{100 \times 208}{1584} = \$13\cdot\dot{1}\dot{3}$$

(³) Also to have gained \$400 he should have sold the wheat for \$1584 + \$400 = \$1984.
And \$1984 ÷ 1280 = \$1.55 = required price per bus.

(7) (¹) If he buys for 6s. 8d. and sells for 7s. 4d. he gains 8d.
∴ 6s. 8d. : 100d. :: 8d. : required gain per cent.

$$\therefore \text{ Gain per cent.} = \frac{8 \times 100}{80} = 10 \text{ per cent.}$$

Also if he buys for 7s. 4d. and sells for 6s. 8d. he loses 8d.
(²) ∴ 7s. 4d. : 100d. :: 8d. : required loss per cent.

$$\therefore \text{ Loss per cent.} = \frac{8 \times 100}{88} = 9\tfrac{1}{11} \text{ per cent.} = £9\ 1\text{s. } 9\tfrac{3}{4}\text{d. } \tfrac{3}{11}\text{q.}$$

(8) If it cost \$96 per cwt. the price per lb. will be 96 cents.
∴ \$100 : \$125 :: 96 cents : price required.

$$\therefore \text{ Price required} = \frac{96 \times 125}{100} \text{ cents} = \$1.20.$$

(9) \$6 per cwt. = 6 cents per lb.
∴ Gain per lb. = (10 − 6)d. = 4 cents.
6 cents : \$100 :: 4 cents : gain per cent.

$$\therefore \text{ Gain per cent.} = \frac{10000 \times 4}{6} = \$66.66\tfrac{2}{3} = 66\tfrac{2}{3} \text{ per ct.}$$

(10) £100 : $112\frac{1}{2}$ :: 4s. 8d. : required price.

$$\therefore \text{ Required price} = \frac{56 \times 112\frac{1}{2}}{100}\text{d.} = 63\text{d.} = 5\text{s. } 3\text{d.}$$

(11) £$112\frac{1}{2}$: 4s. 8d. :: £1000 : prime cost.

∴ Prime cost $=\frac{24000\times 56}{27000}$d. = 4s. $1\frac{3}{4}$d. $\frac{1}{9}$q.

(12) 40 lbs. @ 84c. = \$33.60
44 lbs. @ 93c. = \$40.92
55 lbs. @ \$1.08 = \$59.40
Total cost = \$133.92
∴ Gain = \$188.16 − \$133.92 = \$54.24.
\$133.92 : \$100 :: \$54.24 : required gain per cent.

∴ Gain $=\frac{100\times 54{\cdot}24}{133.92}=40\frac{140}{279}$ per cent.

(13) 26 lbs. @ 5s. 3d. cost £6 16s. 6d.
32 lbs. @ 5s. 7d. cost £8 18s. 8d.
36 lbs. @ 6s. 1d. cost £10 19s.
∴ 94 lbs. cost £26 14s. 2d.
£100 : £40 :: £26 14s. 2d. : gain.

∴ Gain $=\frac{6410\times 40}{100}$d. = £10 13s. 8d.

∴ Selling price will be £26 14s. 2d. + £10 13s. 8d. = £37 7s. 10d.

∴ Price per lb. will be £37 7s. 10d. ÷ 94 = 7s. $11\frac{1}{4}$d. $\frac{41}{47}$q.

(14) £90 : £100 :: 15s. : buying price.

∴ Buying price $=\frac{15\times 100}{90}$s. = 16s. 8d.

£100 : £110 :: 16s. 8d. : required selling price.

∴ Required price $=\frac{200\times 110}{100}$d. = 220d. = 18s. 4d.

(15) He gains on 11 eggs the price of 7 eggs.
∴ 11 : 7 :: £100 : required gain.

∴ Gain $=\frac{100\times 7}{11}$ = £63 12s. $8\frac{1}{2}$d. $\frac{10}{11}$q.

(16) \$130 : \$100 :: \$1.56 : cost price.

∴ Cost price = \$ $\frac{1.56\times 100}{130}$ = \$1.20.

Ex. LXXV. (p. 142.)

(1)	(2)	(3)
104	$4.25	87·8
96	$5.75	87·7
92	$6.60	87·6
90	$7.80	86.8
82	$3.50	85·0
81	$5.58	84·5
		83·8
6) 545	6) $33.48	78·0
		77·9
$90{\cdot}8\dot{3}$	$5.58	77·6
		10) 836·7
		83·67

(4)

United ages of 17 children = 102 years.
United ages of 26 children = 195 years.
United ages of 35 children = 323·75 years.
United ages of 20 children = 200 years.
United ages of 8 children = 98 years.

∴ United ages of 106 = 918·75 years.
∴ Average age = 918·75 years ÷ 106 = 8·667 ... years.

(5)

United ages of 27 men = 1539 years.
United ages of 11 men = 583 years.
United ages of 8 men = 474 years.

∴ United ages of 19 men = 1057 years.

∴ The united ages of the remaining 8 men = (1539 − 1057) years = 482 years. ∴ The average age = 482 ÷ 8 = 60¼ years.

(6) 100 : 112 :: 31326 : population of 1st in 1861.

$$\therefore \text{Population} = \frac{31326 \times 112}{100} = 35085{\cdot}12.$$

100 : 110 :: 42324 : population of 2d in 1861.

$$\therefore \text{Population} = \frac{42324 \times 110}{100} = 46556{\cdot}4.$$

100 : 82 :: 6706 : population of 3d in 1861.

$$\therefore \text{Population} = \frac{6706 \times 82}{100} = 5498{\cdot}92.$$

∴ United population in 1861 $= 35085{\cdot}12 + 46556{\cdot}4 + 5498{\cdot}92 = 87140{\cdot}44$.

∴ Average population $= 87140{\cdot}44 \div 3 = 29046{\cdot}81\dot{3}$.

(7) Whole gain from 1853 to 1863 = £184 11s. 6d. × 11 = £2030 6s. 6d.

£2030 6s. 6d. + £151 9s. 10d. = whole gain = £2181 16s. 4d.

£2181 16s. 4d. − £76 8s. 4d. = £2105 8s. = whole gain during 11 years. ∴ Average gain = £2105 8s. ÷ 11 = £191 8s.

Ex. LXXVI. (p. 145.)

(1) (1) $2+3+4=9$.
9 : 12 :: 1008 : 1st part.

$$\therefore \text{1st part} = \frac{1008 \times 2}{9} = 224.$$

9 : 3 :: 1008 : 2d part.

$$\therefore \text{2d part} = \frac{1008 \times 3}{9} = 336.$$

9 : 4 :: 1008 : 3d part.

$$\therefore \text{3d part} = \frac{1008 \times 4}{9} = 448.$$

(2) $5+11+16=32$.
32 : 5 :: \$260 : 1st part.

$$\therefore \text{1st part} = \$\frac{260 \times 5}{32} = \$40.62\tfrac{1}{2}.$$

(Continued on next page.)

(1 Continued.)

32 : 11 :: \$260 : 2d part.

∴ 2d part $= \$\frac{260 \times 11}{32} = \$89.37\frac{1}{2}$.

32 : 16 :: \$260 : 3d part.

∴ 3d part $= \$\frac{260 \times 16}{32} = \$130$.

(3) 11 : 5 :: 145 ac., 3 ro., 33 po. : share of 1st.

∴ Share of 1st. $= \frac{145 \text{ ac., } 3 \text{ ro., } 33 \text{ po.} \times 5}{11} = 66$ ac., 1 ro., 15 po.

11 : 6 :: 145 ac., 3ro., 33 po. : share of 2d.

∴ Share of 2d $= \frac{145 \text{ ac., } 3\text{ro , } 33 \text{ po.} \times 6}{11} = 79$ ac., 2 ro., 18 po.

(4) $\frac{1}{2}+\frac{1}{3}+\frac{1}{4}+\frac{1}{5}=\frac{77}{60}$.

$\frac{77}{60}$: $\frac{1}{2}$ :: £110 : share of 1st.

∴ Share of 1st. = £$\frac{110 \times 60}{77 \times 2}$ = £42 17s. $1\frac{1}{2}$d. $\frac{6}{7}$q.

$\frac{77}{60}$: $\frac{1}{3}$ :: £110 : share of 2d.

∴ Share of 2d = $\frac{110 \times 60}{77 \times 3}$ = £28 11s. $5\frac{1}{7}$d.

$\frac{77}{60}$: $\frac{1}{4}$ :: £110 : share of 3d.

∴ Share of 3d = £$\frac{110 \times 60}{77 \times 4}$ = £21 8s. $6\frac{3}{4}$d. $\frac{3}{7}$q.

$\frac{77}{60}$: $\frac{1}{5}$ :: £110 : share of 4th.

∴ Share of 4th = £$\frac{110 \times 60}{77 \times 5}$ = £17 2s. $10\frac{1}{4}$d. $\frac{1}{7}$q.

(2) (1) \$320 + \$560 + \$720 = \$1600.

\$1600 : \$320 :: \$680 : *A*'s share of the gain.

∴ *A*'s share $= \$\frac{680 \times 320}{1600} = \$136$.

\$1600 : \$560 :: \$680 : *B*'s share of the gain.

∴ *B*'s share $= \$\frac{680 \times 569}{1600} = \$238$.

(Continued on next page.)

(2 continued.)

\$1600 : \$720 :: \$680 : *C*'s share of the gain.

$$\therefore C\text{'s share} = \$\frac{680 \times 720}{1600} = \$306.$$

(^{2}) £175 + £210 + £265 = £650.
£650 : £210 :: £422 10s. : *C*'s share.

$$\therefore C\text{'s share} = £\frac{422\frac{1}{2} \times 210}{650} = £136\ 10\text{s.}$$

(3) 48·856 + 43·265 = 92·121.
100 − 92·121 = 7·879 = per centage of hydrogen.
100 : 48·856 :: 2240 : No. of lbs. of oxygen.

$$\therefore \text{Lbs. of oxygen} = \frac{2240 \times 48{\cdot}856}{100} = 1094{\cdot}3744.$$

100 : 43·265 :: 2240 : No. of lbs. of carbon.

$$\therefore \text{Lbs. of carbon} = \frac{2240 \times 43{\cdot}265}{100} = 969{\cdot}136.$$

100 : 7·879 :: 2240 : No. of lbs. of hydrogen.

$$\therefore \text{No. of lbs. of hydrogen} = \frac{2240 \times 7{\cdot}879}{100} = 176{\cdot}4896$$

(4) 3 : 2 :: 100 : per centage of gold.

$$\therefore \text{Per centage of gold} = \frac{100 \times 2}{3} = 66\tfrac{2}{3}.$$

3 : 1 :: 100 : per centage of silver.

$$\therefore \text{Per centage of silver} = \frac{100 \times 1}{3} = 33\tfrac{1}{3}.$$

$$(5)\ \text{Equated time} = \frac{150 \times 2 + 210 \times 6 + 120 \times 7}{150 + 210 + 120} = 5 \text{ mos.}$$

$$(6)\ \text{Equated time} = \frac{(1000 \times 6) - (400 \times 3)}{1000 - 400} = 8 \text{ mos.}$$

(7) \$4000 × 2 = \$8000 = *A*'s contribution.
\$300 × 2 + 300 × 1½ = \$1050 = *B*'s contribution.
\$200 × 2 + 500 × 1 = \$900 = *C*'s contribution.
\$8000 + \$1050 + \$900 = \$9950.
\$9950 : \$8000 :: \$7960 : *A*'s share of the gain.

$$\therefore A\text{'s share} = \$\frac{7960 \times 8000}{9950} = \$6400.$$

(Continued on next page.)

(7 continued.)

\$9950 : \$1050 :: \$7960 : *B*'s share of the gain.

$\therefore$ *B*'s share $= \frac{1050 \times 7960}{9950} = \$840$.

\$9950 : \$900 : \$7960 : *C*'s share of the gain.

$\therefore$ *C*'s share $= \$\frac{7960 \times 900}{9950} = \$720$.

(8) 10 per cent. of £1600 = £160; £1600 − £160 = £1440.

£6400 : £2400 :: £1440 : *A*'s share of the gain.

$\therefore$ *A*'s share $= £\frac{2400 \times 1440}{6400} = £540$, which added to £160 = £700.

£6400 : £4000 :: £1440 : *B*'s share of the gain.

$\therefore$ *B*'s share $= £\frac{1440 \times 4000}{6400} = £900$.

(9) Since the keep of a horse : the keep of a sheep :: 3 : 1, therefore 20 horses are equivalent to 60 sheep.

In the same manner 15 oxen are equivalent to 30 sheep.

$\therefore$ *A* puts in 60 sheep,
B puts in 30 sheep,
C puts in 10 sheep.

60 + 30 + 10 = 100.

100 : 60 :: \$60 : *A*'s share of the rent.

$\therefore$ *A*'s share $= \$\frac{60 \times 60}{100} = \$36$.

100 : 30 :: \$60 : *B*'s share of the rent.

$\therefore$ *B*'s share $= \$\frac{60 \times 30}{100} = \$18$.

100 : 10 :: \$60 : *C*'s share of the rent.

$\therefore$ *C*'s share $= \$\frac{60 \times 10}{100} = \$6$.

(10) 9 : 10 :: $1\frac{1}{2}$ pts. : widow's share.

$\therefore$ Widow's share $= \dfrac{1\frac{1}{2} \times 10}{9}$ pts. $= 1\frac{2}{3}$ pts.

5 : 6 :: $1\frac{2}{3}$ pts. : old man's share.

$\therefore$ Old man's share $= \dfrac{1\frac{2}{3} \times 6}{5}$ pts. $=2$ pts.

If one widow receive $1\frac{2}{3}$ pts. 9 will receive $(9 \times 1\frac{2}{3}) =$ 15 pts.: similarly 6 single women will receive $(6 \times 1\frac{1}{2})$ pts. $= 9$ pts. $\therefore$ The total amount given to the women $= (15+9)$ pts. $= 24$ pts. But the men had twice as much as the women, $\therefore$ the men received (24×2) pts. $=$ 48 pts.; and as each man received 2 pts. the total number of men must have been $48 \div 2 = 24$.

Ex. LXXVII. (p. 149.)

(1)

$$\begin{array}{r|l} & \dot{1}9\dot{6}\ (14 \\ & 1 \\ \hline 24 & 96 \\ & 96 \\ \hline \end{array} \qquad \begin{array}{r|l} & \dot{2}8\dot{9}\ (17 \\ & 1 \\ \hline 27 & 189 \\ & 189 \\ \hline \end{array} \qquad \begin{array}{r|l} & \dot{6}2\dot{5}\ (25 \\ & 4 \\ \hline 45 & 225 \\ & 225 \\ \hline \end{array}$$

(2)

$$\begin{array}{r|l} & \dot{8}4\dot{1}\ (29 \\ & 4 \\ \hline 49 & 441 \\ & 441 \\ \hline \end{array} \qquad \begin{array}{r|l} & \dot{9}0\dot{0}\ (30 \\ & 9 \\ \hline 60 & 00 \\ & 00 \\ \hline \end{array} \qquad \begin{array}{r|l} & \dot{1}7\dot{6}4\ (42 \\ & 16 \\ \hline 82 & 164 \\ & 164 \\ \hline \end{array}$$

(3)

$$\begin{array}{r|l} & 2\dot{4}0\dot{1}\ (49 \\ & 16 \\ \hline 89 & 801 \\ & 801 \\ \hline \end{array} \qquad \begin{array}{r|l} & 7\dot{5}6\dot{9}\ (87 \\ & 64 \\ \hline 167 & 1169 \\ & 1169 \\ \hline \end{array} \qquad \begin{array}{r|l} & 9\dot{6}0\dot{4}\ (98 \\ & 81 \\ \hline 188 & 1504 \\ & 1504 \\ \hline \end{array}$$

(4)

$$\begin{array}{r|l} & \dot{1}2\dot{4}2\dot{1}\ (111 \\ & 1 \\ \hline 21 & 23 \\ & 21 \\ \hline 221 & 221 \\ & 221 \\ \hline \end{array} \qquad \begin{array}{r|l} & \dot{4}0\dot{0}0\dot{0}\ (200 \\ & 4 \\ \hline 400 & 0000 \\ & 0000 \\ \hline \end{array} \qquad \begin{array}{r|l} & 3\dot{8}8\dot{1}2\dot{9}\ (623 \\ & 36 \\ \hline 122 & 281 \\ & 244 \\ \hline 1243 & 3729 \\ & 3729 \\ \hline \end{array}$$

(5)

$$\begin{array}{r|l} & 4\dot{9}4\dot{2}0\dot{9}\ (703 \\ & 49 \\ \hline 1403 & 4209 \\ & 4209 \\ \hline \end{array}$$

$$\begin{array}{r|l} & 5\dot{8}2\dot{1}6\dot{9}\ (763 \\ & 49 \\ \hline 146 & 921 \\ & 876 \\ \hline 1523 & 4569 \\ & 4569 \\ \hline \end{array}$$

$$\begin{array}{r|l} & 2\dot{5}9\dot{0}8\dot{1}\ (509 \\ & 25 \\ \hline 1009 & 9081 \\ & 9081 \\ \hline \end{array}$$

(6)

$$\begin{array}{r|l} & \dot{1}2\dot{3}4\dot{3}2\dot{1}\ (1111 \\ & 1 \\ \hline 21 & 23 \\ & 21 \\ \hline 221 & 243 \\ & 221 \\ \hline 2221 & 2221 \\ & 2221 \\ \hline \end{array}$$

$$\begin{array}{r|l} & 2\dot{8}5\dot{4}7\dot{6}4\dot{9}\ (5343 \\ & 25 \\ \hline 103 & 354 \\ & 309 \\ \hline 1064 & 4576 \\ & 4256 \\ \hline 10683 & 32049 \\ & 32049 \\ \hline \end{array}$$

(7)

$$\begin{array}{r|l} & 6\dot{2}5\dot{0}4\dot{8}3\dot{6}\ (7906 \\ & 49 \\ \hline 149 & 1350 \\ & 1341 \\ \hline 15806 & 94836 \\ & 94836 \\ \hline \end{array}$$

$$\begin{array}{r|l} & 3\dot{3}0\dot{1}6\dot{5}1\dot{6}\ (5746 \\ & 25 \\ \hline 107 & 801 \\ & 749 \\ \hline 1144 & 5265 \\ & 4576 \\ \hline 11486 & 68916 \\ & 68916 \\ \hline \end{array}$$

$$\begin{array}{r|l} & 4\dot{9}1\dot{1}2\dot{0}6\dot{4}\ (7008 \\ & 49 \\ \hline 14008 & 112064 \\ & 112064 \\ \hline \end{array}$$

(8)

$$\begin{array}{r|l} & \dot{1}8\dot{2}4\dot{9}3\dot{0}8\dot{1}\ (13509 \\ & 1 \\ \hline 23 & 82 \\ & 69 \\ \hline 265 & 1349 \\ & 1325 \\ \hline 27009 & 243081 \\ & 243081 \\ \hline \end{array}$$

$$\begin{array}{r|l} & 4\dot{7}\cdot 6\dot{1}\ (6\cdot 9 \\ & 36 \\ \hline 12\cdot 9 & 11\cdot 61 \\ & 11\cdot 61 \\ \hline \end{array}$$

(9) $\cdot 0\dot{0}8\dot{8}3\dot{6}$ ($\cdot$094
00
09 | 88
   | 81
184 | 736
    | 736

$\dot{4}4\dot{5}\cdot 3\dot{3}6\dot{6}0\dot{9}$ (21$\cdot$103
4
41 | 45
   | 41
421 | 433
    | 421
42203 | 126609
      | 126609

(10) $\cdot 0\dot{0}0\dot{6}3\dot{3}6\dot{7}9\dot{9}2\dot{9}$ ($\cdot$025173
4
45 | 233
   | 225
501 | 867
    | 501
5027 | 36699
     | 35189
50343 | 151029
      | 151029

$\cdot 0\dot{0}0\dot{0}0\dot{0}0\dot{0}0\dot{9}$ ($\cdot$00003
9

(11) $5\dot{1}\cdot 0\dot{0}0\dot{0}0\dot{0}$ (7$\cdot$1414
49
141 | 200
    | 141
1424 | 5900
     | 5696
14281 | 20400
      | 14281
142424 | 611900
       | 569696

$\cdot 5\dot{1}0\dot{0}0\dot{0}0\dot{0}$ ($\cdot$7141
49
141 | 200
    | 141
1424 | 5900
     | 5696
14281 | 20400
      | 14281

(12) $\dot{5}\cdot1\dot{0}0\dot{0}0\dot{0}0\dot{0}$ (2·2583

$$\begin{array}{r|l} & 4 \\ \hline 42 & 110 \\ & 84 \\ \hline 445 & 2600 \\ & 2225 \\ \hline 4508 & 37500 \\ & 36064 \\ \hline 45163 & 143600 \\ & 135489 \\ \hline \end{array}$$

$\cdot0\dot{5}1\dot{0}0\dot{0}0\dot{0}$ (·2258

$$\begin{array}{r|l} & 4 \\ \hline 42 & 110 \\ & 84 \\ \hline 445 & 2600 \\ & 2225 \\ \hline 4508 & 37500 \\ & 36064 \\ \hline & 1436 \end{array}$$

(13) $\dot{8}0\dot{6}\cdot5\dot{2}0\dot{0}0\dot{0}0\dot{0}$ (28·03992

$$\begin{array}{r|l} & 4 \\ \hline 48 & 406 \\ & 384 \\ \hline 563 & 2252 \\ & 1689 \\ \hline 5669 & 56300 \\ & 51021 \\ \hline 56789 & 527900 \\ & 511101 \\ \hline 567982 & 1679900 \\ & 1135964 \\ \hline \end{array}$$

$\dot{9}6\dot{3}0\dot{4}\cdot9\dot{9}3\dot{0}0\dot{0}0\dot{0}$ (310·3304

$$\begin{array}{r|l} & 9 \\ \hline 61 & 63 \\ & 61 \\ \hline 6203 & 20499 \\ & 18609 \\ \hline 62063 & 189030 \\ & 186189 \\ \hline 6206604 & 28410000 \\ & 24826416 \\ \hline \end{array}$$

(14) $\cdot3\dot{3}3\dot{3}3\dot{3}$ (·577

$$\begin{array}{r|l} & 25 \\ \hline 107 & 833 \\ & 749 \\ \hline 1147 & 8433 \\ & 8029 \\ \hline \end{array}$$

(15) $\cdot0\dot{2}7\dot{7}7\dot{7}$ (·166

$$\begin{array}{r|l} & 1 \\ \hline 26 & 177 \\ & 156 \\ \hline 326 & 2177 \\ & 1956 \\ \hline \end{array}$$

(16) $4\frac{36}{49} = 4\cdot734693$ ...

$\dot{4}\cdot7\dot{3}4\dot{6}9\dot{3}$ (2·175

$$\begin{array}{r|l} & 4 \\ \hline 41 & 73 \\ & 41 \\ \hline 427 & 3246 \\ & 2989 \\ \hline 4345 & 25793 \\ & 21725 \\ \hline \end{array}$$

(17) $2\dot{3}0\dot{4}$ (48

$$\begin{array}{r|l} & 16 \\ \hline 88 & 704 \\ & 704 \\ \hline \end{array}$$

$3\dot{4}8\dot{1}$ (59

$$\begin{array}{r|l} & 25 \\ \hline 109 & 981 \\ & 981 \\ \hline \end{array}$$

$\therefore \sqrt{\frac{2304}{3481}} = \frac{48}{59}$.

(18)

$$\begin{array}{r|l} & \dot{4}\cdot4\dot{1}\ (2\cdot1 \\ & 4 \\ \hline 41 & 41 \\ & 41 \\ \hline \end{array} \qquad \begin{array}{l} \cdot6\dot{4}\ (\cdot8 \\ 64 \\ \hline \end{array} \qquad 2\cdot1 \div \cdot8 = 2\cdot625$$

(19) 5832 sovereigns = 13996780 pence and 2s. 6d. = 30d.; ∴ the sovereigns were worth (1399680÷30) times the box = 46656.

The square root of 46656 is 216; ∴ the sovereigns were worth 216 times the shillings and the shillings were worth 216 times the box. But the value of the box is 2s. 6d.; ∴ the value of the shillings will be 216 times 2s. 6d. or 540 shillings.

Ex. LXXVIII. (p. 152.)

(1)

$$\begin{array}{r|l} & \dot{1}72\dot{8}\ (12 \\ & 1 \\ \hline 3\times1^2=3 & 728 \\ 3\times10^2=300 & \\ 3\times10\times2=60 & \\ 2^2=4 & \\ \hline 364 & \\ 2 & \\ \hline 728 & 728 \\ \hline \end{array} \qquad \begin{array}{l} \dot{8}00\dot{0}\ (20 \\ 8 \\ \hline 000 \\ 000 \\ \hline \end{array} \qquad \begin{array}{r|l} & \dot{5}83\dot{2}\ (18 \\ & 1 \\ \hline 3\times1^2=3 & 4832 \\ 3\times10^2=300 & \\ 3\times10\times8=240 & \\ 8^2=64 & \\ \hline 604 & \\ 8 & \\ \hline 4832 & 4832 \\ \hline \end{array}$$

(2)

$$\begin{array}{r|l} & 7\dot{4}08\dot{8}\ (42 \\ & 64 \\ \hline 3\times4^2=48 & 10088 \\ 3\times40^2=4800 & \\ 3\times40\times2=240 & \\ 2^2=4 & \\ \hline 5044 & \\ 2 & \\ \hline 10088 & 10088 \\ \hline \end{array} \qquad \begin{array}{r|l} & 42\dot{1}87\dot{5}\ (75 \\ & 343 \\ \hline 3\times7^2=147 & 78875 \\ 3\times70^2=14700 & \\ 3\times70\times5=1050 & \\ 5^2=25 & \\ \hline 15775 & \\ 5 & \\ \hline 78875 & 78885 \\ \hline \end{array}$$

(Continued on next page.)

(2 continued.)

$$\begin{array}{r|l}
 & 77\dot{8}68\dot{8}\ (92 \\
 & 729 \\ \hline
3\times9^2=243 & 49688 \\
3\times90^2=24300 & \\
3\times90\times2=540 & \\
2^2=4 & \\ \cline{1-1}
24844 & \\
2 & \\ \cline{1-1}
49688 & 49688 \\ \hline
\end{array}$$

(3)

$$\begin{array}{r|l}
 & 91\dot{2}67\dot{3}\ (97 \\
 & 729 \\ \hline
3\times9^2=243 & 183673 \\
3\times90^2=24300 & \\
3\times90\times7=1890 & \\
7^2=49 & \\ \cline{1-1}
26239 & \\
7 & \\ \cline{1-1}
183673 & 183673 \\ \hline
\end{array}$$

$$\begin{array}{r|l}
 & \dot{1}09\dot{2}72\dot{7}\ (103 \\
 & 1 \\ \hline
3\times1^2=3 & 92727 \\
3\times10^2=300 & \\
3\times100^2=30000 & \\
3\times100\times3=900 & \\
3^2=9 & \\ \cline{1-1}
30909 & \\
3 & \\ \cline{1-1}
92727 & 92727 \\ \hline
\end{array}$$

(4)

$$\begin{array}{r|l}
 & 13\dot{4}21\dot{7}72\dot{8}\ (512 \\
 & 125 \\ \hline
3\times5^2=75 & 9217 \\
3\times50^2=7500 & \\
3\times50\times1=150 & \\
1^2=1 & \\ \cline{1-1}
7651 & 7651 \\ \hline
3\times51^2=7803 & 1566728 \\
3\times510^2=780300 & \\
3\times510\times2=3060 & \\
2^2=4 & \\ \cline{1-1}
783364 & \\
2 & \\ \cline{1-1}
1566728 & 1566728 \\ \hline
\end{array}$$

$$\begin{array}{r|l}
 & 6\dot{4}\cdot48\dot{1}20\dot{1}\ (4\cdot01 \\
 & 64 \\ \hline
3\times4^2=48 & 481201 \\
3\times40^2=4800 & \\
3\times400^2=480000 & \\
3\times400\times1=1200 & \\
1^2=1 & \\ \cline{1-1}
481201 & 481201 \\ \hline
\end{array}$$

(5)

$$\begin{array}{r|l}
 & 44\dot{4}19\dot{4}\cdot94\dot{7}\ (76\cdot3 \\
 & 343 \\
\hline
3\times7^2=147 & 101194 \\
3\times70^2=14700 & \\
3\times70\times6=1260 & \\
6^2=36 & \\
\hline
15996 & 95976 \\
\hline
3\times76^2=17328 & 5218947 \\
3\times760^2=1732800 & \\
3\times760\times3=6840 & \\
3^2=9 & \\
\hline
1739649 & \\
3 & \\
\hline
5218947 & 5218947 \\
\hline
\end{array}$$

$$\begin{array}{r|l}
 & \cdot00\dot{0}20\dot{2}26\dot{2}00\dot{3}\ (\cdot0587 \\
 & 125 \\
\hline
3\times5^2=75 & 77262 \\
3\times50^2=7500 & \\
3\times50\times8=1200 & \\
8^2=64 & \\
\hline
8764 & 70112 \\
\hline
3\times58^2=10092 & 7150003 \\
3\times580^2=1009200 & \\
3\times580\times7=12180 & \\
7^2=49 & \\
\hline
1021429 & 7150003 \\
\hline
\end{array}$$

(6)

$$
\begin{array}{r|l}
 & 13\dot{1}\cdot01\dot{9}1\dot{0}803\dot{9}\ (5\cdot079 \\
 & 125 \\
\cline{2-2}
3\times5^2=75 & \quad 6019108 \\
3\times50^2=7500 & \\
3\times500^2=750000 & \\
3\times500\times7=10500 & \\
7^2=49 & \\
\cline{1-1}
760549 & \quad 5323843 \\
\cline{2-2}
3\times507^2=771147 & \qquad 695265039 \\
3\times5070^2=77114700 & \\
3\times5070\times9=136890 & \\
9^2=81 & \\
\cline{1-1}
77251671 & \qquad 695265039 \\
\cline{2-2}
\end{array}
$$

$$
\begin{array}{r|l}
 & \dot{4}08\dot{5}18\dot{4}88\dot{0}00\ (7420 \\
 & 343 \\
\cline{2-2}
3\times7^2=147 & 65518 \\
3\times70^2=14700 & \\
3\times70\times4=840 & \\
4^2=16 & \\
\cline{1-1}
15556 & 62224 \\
\cline{2-2}
3\times74^2=16428 & \quad 3294488 \\
3\times740^2=1642800 & \\
3\times740\times2=4440 & \\
2^2=4 & \\
\cline{1-1}
1647244 & \quad 3294488 \\
\cline{2-2}
 & \qquad\qquad 000 \\
\end{array}
$$

(7) $\sqrt[3]{27}=3$ $\quad\sqrt[3]{64}=4$ $\quad\therefore\ \sqrt[3]{\tfrac{27}{64}}=\tfrac{3}{4}$

(8) $\frac{4}{15} = \cdot 2\dot{6}$

$$\begin{array}{r|l}
\multicolumn{1}{r}{} & \cdot 26\dot{6}66\dot{6}66\dot{6}\ (\cdot 643 \\
\multicolumn{1}{r}{} & 216 \\ \cline{2-2}
3\times 6^2=108 & 50666 \\
3\times 60^2=10800 & \\
3\times 60\times 4=720 & \\
4^2=16 & \\ \cline{1-1}
11536 & 46144 \\ \hline
3\times 64^2=12288 & \quad 4522666 \\
3\times 640^2=1228800 & \\
3\times 640\times 3=5760 & \\
3^2=9 & \\ \cline{1-1}
1234569 & \quad 3703707 \\ \cline{2-2}
\end{array}$$

(9) $3\frac{4}{5} = 3\cdot 8$

$$\begin{array}{r|l}
\multicolumn{1}{r}{} & 3\cdot 80\dot{0}00\dot{0}00\dot{0}\ (1\cdot 560 \\
\multicolumn{1}{r}{} & 1 \\ \cline{2-2}
3\times 1^2=3 & 2800 \\
3\times 10^2=300 & \\
3\times 10\times 5=150 & \\
5^2=25 & \\ \cline{1-1}
475 & 2375 \\ \hline
3\times 15^2=675 & \quad 425000 \\
3\times 150^2=67500 & \\
3\times 150\times 6=2700 & \\
6^2=36 & \\ \cline{1-1}
70236 & \quad 421416 \\ \hline
3\times 156^2=73008 & \qquad 3584000 \\
3\times 1560^2=7300800 & \\
3\times 1560\times 0=0 & \\
0^2=0 & \\ \hline
7300800 & \\
\end{array}$$

(10) $\sqrt[3]{1} = 1$

(11)

$$\begin{array}{r|l}
 & \cdot 10\dot{0}00\dot{0}00\dot{0}\ (\cdot 464 \\
 & \underline{64} \\
3\times 4^2=48 & 36000 \\
3\times 40^2=4800 & \\
3\times 40\times 6=720 & \\
\underline{6^2=36} & \\
\underline{5556} & \underline{33336} \\
3\times 46^2=6348 & 2664000 \\
3\times 460^2=634800 & \\
3\times 460\times 4=5520 & \\
\underline{4^2=16} & \\
640336 & \underline{2561344}
\end{array}$$

(12)

$$\begin{array}{r|l}
 & \cdot 01\dot{0}00\dot{0}00\dot{0}\ (\cdot 215 \\
 & \underline{8} \\
3\times 2^2=12 & 2000 \\
3\times 20^2=1200 & \\
3\times 20\times 1=60 & \\
1^2=1 & \\
\overline{1261} & \underline{1261} \\
3\times 21^2=\overline{1323} & 739000 \\
3\times 210^2=132300 & \\
3\times 210\times 5\times 3150 & \\
\underline{5^2=25} & \\
135475 & \underline{677375}
\end{array}$$

(13)

	$1\dot{0}\cdot00\dot{0}00\dot{0}00\dot{0}$ (2·154
	8
$3\times2^2=12$	2000
$3\times20^2=1200$	
$3\times20\times1=60$	
$1^2=1$	
1261	1261
$3\times21^2=1323$	739000
$3\times210^2=132300$	
$3\times210\times5=3150$	
$5^2=25$	
135475	677375
$3\times215^2=138675$	61625000
$3\times2150^2\times13867500$	
$3\times2150\times4=25800$	
$4^2=16$	
13893316	55573264

(14)

	$03\dot{7}37\dot{3}73\dot{7}$ (·333
	27
$3\times3^2=27$	10373
$3\times30^2=2700$	
$3\times30\times3=270$	
$3^2=9$	
2979	8937
$3\times33^2=3267$	1436737
$3\times330^2=326700$	
$3\times330\times3=2970$	
$3^2=9$	
329679	989037

Ex. LXXIX. (p. 152.)

PAPER I.

(1) oz.

$$\begin{array}{l} 16\left\{\begin{array}{l} 4)\ \underline{553553} \\ 4)\ \underline{138388}-1\quad 4\times 0+ \\ \qquad\qquad\qquad [1=1\text{ oz.} \end{array}\right. \\ 28\left\{\begin{array}{l} 4)\ \underline{34597}-0 \\ 7)\ \underline{8649}-1\quad 4\times 4+ \\ \qquad\qquad\qquad [1=17\text{ lbs.} \end{array}\right. \\ \quad 4)\ \underline{1235}-4 \\ \quad 20)\ \underline{308}-3\text{ qrs.} \\ \qquad\quad 15\text{ tons, } 8\text{ cwt.} \end{array}$$

15 Tons, 8 cwt., 3 qrs.,
17 lbs., 1 oz.

(2)
(2)
144 : 175 :: 12 oz. : poportion of a lb. Avoirdupoise.

$$\frac{175\times 12}{144}=14\tfrac{7}{12}.$$

∴ 1 oz. Avoir. : 1 oz. Troy :: $14\tfrac{7}{12}$: 16 or as 175 : 192.
∴ 1oz. Avoir. is $\tfrac{175}{192}$ of 1 oz. Troy.

(3)

	£	fl.	c.	m.	
	2.	0.	7.	0.	= value of 1 cwt.
				16	
2 qrs. = $\tfrac{1}{2}$ of 1 cwt.	32	11	2	0	= value of 16 cwt.
1 qr. = $\tfrac{1}{2}$ of 2 qrs.	1	0	3	5	= value of 2 qrs.
14 lbs. = $\tfrac{1}{2}$ of 1 qr.		5	1	$7\cdot5$	= value of 1 qr.
2 lbs. = $\tfrac{1}{7}$ of 14 lbs.		2	5	$8\cdot75$	= value of 14 lbs.
			3	$6\cdot96\dot{4}2857\dot{1}$	= val. of 2 lbs.
	£34.	9.	6.	$8\cdot21\dot{4}2857\dot{1}$	= value of [16 cwt., 3 qrs., 14 lbs.

(4) (^{1}) 20803) 67273 (3
62409

4864) 20803 (4
19456

1347) 4864 (3
4041

823) 1347 (1
823

524) 823 (1
524

299) 524 (1
299

225) 299 (1
225

74) 225 (3
222

3) 74 (24
72

2) 3 (1
2

1

∴ 1 is the G. C. M.

(^{2})

$$\begin{array}{l|llllllll} 2) & 8, & \cancel{9}, & 10, & \cancel{12}, & 15, & 18, & 35, & 84 \\ \hline 2) & 4, & \cancel{5}, & & & 15, & 9, & 35, & 42 \\ \hline 3) & 2, & & & & 15, & 9, & 35, & 21 \\ \hline & 2, & & & & \cancel{5}, & 3, & 35, & \cancel{7} \end{array}$$

∴ L. C. M. $= 2 \times 2 \times 3 \times 2 \times 3 \times 35 = 2520.$

(5) (^{1}) $\frac{3}{8}$ of $\frac{5}{11}$ of $99\frac{11}{15} = \frac{3}{8}$ of $\frac{5}{11}$ of $\frac{1496}{15} = 17$
$\frac{5}{7}$ of $\frac{2}{9}$ of $69\frac{3}{10} = \frac{5}{7}$ of $\frac{2}{9}$ of $\frac{693}{10} = 11$
$\frac{2}{7}$ of $\frac{2}{5}$ of $306\frac{1}{4} = \frac{2}{7}$ of $\frac{2}{5}$ of $\frac{1225}{4} = 35$
$17 + 11 + 35 = 63.$

(^{2}) 13s. $1\frac{1}{2}$d. = 315 half pence
$\frac{3}{4}$ of $1\frac{1}{2}$ of a guinea $= \frac{3}{4}$ of $\frac{3}{2}$ of 504 h'f p. = 567 h'f p.
∴ Fraction required is $\frac{315}{567} = \frac{5}{9}$.

(Continued on next page.)

(5 continued.)

(3) $\frac{107}{448}$ of a ton $= \frac{107 \times 20}{448}$ cwt. $= 4\frac{87}{112}$ cwt.

$\frac{87}{112}$ of a cwt. $= \frac{87 \times 4}{112}$ qrs. $= 3\frac{3}{28}$ qrs.

$\frac{3}{28}$ of a qr. $= \frac{3 \times 28}{28}$ lbs. $= 3$ lbs.

4 cwt., 3 qrs., 3 lbs.

(6) ·37) 7792·20 (21060
74
———
39
37
———
222
222
———
0

7792·2 = $7792\frac{1}{5}$
·37 = $\frac{37}{100}$
$7792\frac{1}{5} \div \frac{37}{100} = \frac{38961}{5} \times \frac{100}{37}$
= 21060.

370) ·0077922 (·00002106
74
———
39
37
———
222
222
———

·007792 = $\frac{7792}{10000000}$
$\frac{7792}{10000000} \times \frac{1}{370} = \frac{2106}{100000000}$
= ·00002106.

PAPER II.

(1) (1) \$7300
$3\frac{3}{4}$
———
\$21900
5475
———
\$273.75

365 : 120 :: \$273.75 : interest required.

$\therefore$ Int. req^{d} $= \$\frac{273\cdot75 \times 120}{365}$

= \$90

(2) Int. on £100 for $2\frac{3}{4}$ yrs. at $3\frac{1}{2}$ per cent. = £9 12s. 6d.
£109 12s. 6d. : £3204 14s. 1d. :: £9 12s. 6d. : disc't req^{d}

$\therefore$ Disc't $= \frac{769129 \times 2310}{26310}$ d.

= 67529d. = £281 7s. 5d.

(2) \$3320 − \$2656 = \$664.

\$2656 : \$100 :: \$664 : required gain per cent.

$$\therefore \text{Required gain} = \$\frac{664 \times 100}{2656} = \$25.$$

\$3320 : \$100 :: \$664 : loss per cent.

$$\therefore \text{Loss per cent.} = \$\frac{664 \times 100}{3320} = \$20.$$

(3) (1)

$$\begin{array}{r|l}
 & \dot{9}3\dot{0}3\dot{7}2\dot{0}0\dot{4}\ (30502 \\
 & 9 \\ \hline
605 & 3037 \\
 & 3025 \\ \hline
61002 & 122004 \\
 & 122004 \\ \hline
\end{array}$$

(2)

$$\begin{array}{r|l}
 & 1\dot{6}77\dot{7}21\dot{6}\ (256 \\
 & 8 \\ \hline
3 \times 2^2 = 12 & 8777 \\
3 \times 20^2 = 1200 & \\
3 \times 20 \times 5 = 300 & \\
5^2 = 25 & \\ \hline
1525 & 7625 \\ \hline
3 \times 25^2 = 1875 & 1152216 \\
3 \times 250^2 = 187500 & \\
3 \times 250 \times 6 = 4500 & \\
6^2 = 36 & \\ \hline
192036 & 1152216 \\ \hline
\end{array}$$

(3) Surface of square = 2533 sq. ft., 64 sq. in. or 364816 sq. inches; ∴side of square = $\sqrt{364816}$ sq. in. = 604 in. = 16 yds., 2 ft., 4 in.; ∴ perimeter of square = 16 yds., 2 ft., 4 in. × 4 = 67 yds., 4 in.

(4)

$$\begin{array}{r} 365 \\ 5 \\ \hline 1825 \end{array} \qquad \begin{array}{r} 365 \\ 20 \\ \hline 7300 \end{array} \qquad \begin{array}{r} 365 \\ 300 \\ \hline 109500 \end{array} \qquad \begin{array}{r} 109500 \\ 7300 \\ 1825 \\ \hline 118625 \end{array}$$

```
(5)   2) 22932
      --------
      2) 11466          2 × 2 × 3 × 3 × 7 × 7 × 13.
      --------
       3) 5733             7) 637
       -------             ------
       3) 1911              7) 91
       -------              -----
       7) 637                13
```

(6) If he travels $22\frac{1}{7}$ miles per hour, he will travel 20 miles in $\frac{20}{22\frac{1}{7}}$ of an hour, or $\frac{28}{31}$ hours.

He then travels the remaining 32 miles at the rate of ($\frac{1}{6}$ of $22\frac{1}{7}$) miles per hour $= 3\frac{29}{42}$ miles per hour.

∴ To travel 32 miles he would require $(32 \div 3\frac{29}{42})$ hrs. $= 8\frac{104}{155}$ hrs. which added to the above $\frac{28}{31}$ hr. $= 9\frac{89}{155}$ hrs. or 9 hrs., $34'\ 27\frac{3}{31}''$.

If he start at 9 A. M. and travel for 9 hrs. $34'\ 27\frac{3}{31}''$ he will arrive at his journey's end at 6 h. $34'\ 27\frac{3}{31}''$ P. M.

PAPER III.

(1) If *A* fire twice in 3 minutes, he requires $1\frac{1}{2}$ minutes to fire once; ∴ to fire 55 cartridges he requires $(55 \times 1\frac{1}{2})$ minutes $= 82\frac{1}{2}$ minutes.

Similarly *B* will require $(55 \times 1\frac{2}{3}$ minutes $= 91\frac{2}{3}$ minutes; ∴ *B* will be firing $(91\frac{2}{3} - 82\frac{1}{2})$ minutes after *A* has ceased $= 9\frac{1}{6}$ minutes: and as he requires $1\frac{2}{3}$ minutes to fire once, he will fire $(9\frac{1}{6} \div 1\frac{2}{3})$ times $= 5\frac{1}{2}$ times.

(2) (1) $\frac{17}{20 \times 8} = \frac{17}{160}$

```
160) 17·0 (·10625
     160
     ----
      1000
       960
       ---
       400
       320
       ---
       800
       800
```

(2) 3s. $0\frac{1}{2}$d. = 73 half pence
£5 = 2400 half pence
∴ Fraction $= \frac{73}{2400}$ and dec. =

```
2400) 73·00 (·030416
      7200
      -----
      10000
       9600
      -----
       4000
       2400
      -----
      16000
      14400
      -----
       1600
```

(Continued on next page.)

(2 Continued.)

(³) ·36 of a guinea $= \frac{36}{100} = \frac{9}{25}$ of a guinea.

25) 9
21
189 (7s. $6\frac{18}{25}$d.
175
14
12
168
150
$\frac{18}{25}$

·$\dot{3}\dot{6}$ of a £ $= \frac{36}{99} = \frac{4}{11}$ of a £
4
20
11) 80
7s. $3\frac{3}{11}$d.

∴ ·36 of a guinea = 7s. $6\frac{18}{25}$d.
and ·$\dot{3}\dot{6}$ of a £ = 7s. $3\frac{3}{11}$d.
∴ ·36 of a guinea is the greater.
(⁴) 7s. $6\frac{18}{25}$d. − 7s. $3\frac{3}{11}$d. $= 3\frac{123}{275}$d.

(3) Int. of \$100 for 15 mo's at 5 per cent. = \$6.25.
\$106.25 : \$552.50 :: \$100 : required sum.

$$\therefore \text{Sum required} = \$\frac{100 \times 552.50}{106.25} = \$520.$$

(4) Number of sq. ft. on the walls $= 143 \times 3 \times 2 = 858$
This is obtained from (2 length + 2 breadth) × 11.
∴ (2 length × 2 breadth) × 11 = 858.
or 2 length + 2 breadth = 78; but length = 2 breadth.
∴ 3 breadth = 39. ∴ breadth = 13 ft. and length = 26 ft.
No. of sq. ft. in floor $= 26 \times 13 = 338$, or 37 sq. yds. 5 sq. ft.

(5) From 9 A. M. on Tuesday till 11 A. M. on Wednesday there are 26 hours, during which time the slow clock loses 10 minutes.

Also from 11 A. M. till 9 P. M. on Wednesday there are 10 hours.

26 hours : 10 hours :: 10 minutes : No. of minutes which the slow clock loses in 10 hours $= \frac{10 \times 10}{26}$ min. = 3 minutes, $50\frac{10}{13}$ seconds.

∴ The clock must be put on 10 minutes + 3 minutes, $50\frac{10}{13}$ seconds = 13 minutes, $50\frac{10}{13}$ seconds.

(6) 43 shares at £$11\frac{1}{2}$ = £$494\frac{1}{2}$.

$\therefore$ 128 : $494\frac{1}{2}$ :: 100 stock : stock required.

$\therefore$ Stock required $= \dfrac{494\frac{1}{2} \times 100}{128} = 386\frac{21}{64}$.

Annual income therefrom at 6 per cent. = £23 3s. $7\frac{1}{8}$d.

PAPER IV.

(1) (1) $\frac{1}{5}+\frac{2}{3}+\frac{1}{35}+\frac{5}{21}=\frac{21}{105}+\frac{70}{105}+\frac{3}{105}+\frac{25}{105}=\frac{119}{105}=1\frac{2}{15}$. $1\frac{2}{3}$ of $\dfrac{4}{2\frac{7}{9}}=\dfrac{5}{3}\times\dfrac{4}{\frac{25}{9}}=\dfrac{5}{3}\times\dfrac{36}{25}=\dfrac{12}{5}$. $\therefore$ Fraction required is $\dfrac{1\frac{2}{15}}{\frac{12}{5}}=\dfrac{\frac{17}{15}}{\frac{12}{5}}=\dfrac{17}{15}\times\dfrac{5}{12}=\dfrac{17}{36}$.

(2) ·027) 3·330 ($123\frac{1}{3}$
$$\begin{array}{l} 27 \\ \hline \;63 \\ \;54 \\ \hline \;\;90 \\ \;\;81 \\ \hline \end{array}$$
$\frac{9}{27}=\frac{1}{3}$ $\therefore$ ·027 can be taken 123 times from 3·33 and the fraction remaining is $\frac{1}{3}$.

(2) Each person received £3 3s. $4\frac{1}{2}$d. $\therefore$ The 43 persons received £3 3s. $4\frac{1}{2}$d. × 43 = £136 5s. $1\frac{1}{2}$d.

Then (£1 − 6d.) : £1 :: £136 5s. $1\frac{1}{2}$d. : original am't.

Or 19s. 6d. : £1 :: £136 5s. $1\frac{1}{2}$d. : original am't

$\therefore$ Original amount $= \dfrac{65403 \times 40}{39}$ half pence = 67080 half pence = £139 15s.

(3) (1) $\left.\begin{array}{r}\text{13 cwt. 2 qrs. 19 lbs. : 41 cwt., 1 lb.}\\ \text{35 : 49}\end{array}\right\}$ :: £4 17s. 6d. : required amount.

Or $\left.\begin{array}{r}\text{1531 lbs. : 4593 lbs.}\\ \text{35 : 49}\end{array}\right\}$ :: 1170d. : required amount in pence.

$\therefore$ Am't $= \dfrac{1170 \times 4593 \times 49}{1531 \times 35}$d. = 4914d. = £20 9s. 6d.

(2) The bankrupt ows D \$2085−(\$235+\$325+\$525) =\$2085−\$1085=\$1000.

\$1000 : \$1 :: \$525 : required payment in the \$.

$\therefore$ Payment in the \$ $=\$\dfrac{525\times1}{1000}=52\frac{1}{2}$ cts.

(4) £$112\frac{1}{2}$: 45s. :: £100 : original cost per dozen.

$\therefore$ Original cost per doz. $=\dfrac{2000\times45}{2250}$s. $=40$s.

Since there are 52 dozen in a butt, the average cost for a butt will be (40×52)s.=£104; and for three butts the cost will be £(104×3)=£312. But the first and second butts together cost £(120+110)=£230. $\therefore$ The third butt costs £310 − £230=£82.

(5) 2 Turkeys and 9 fowls cost £2 18s. 6d.

$\therefore$ 10 turkeys and 45 fowls cost £14 12s. 6d.; also 5 turkeys and 2 fowls cost £4 8s. 2d..

$\therefore$ 10 turkeys and 4 fowls cost £8 16s. 4d.

But 10 turkeys and 45 fowls cost £14 12s. 6d.

$\therefore$ 41 fowls cost £5 16s. 2d., and one fowl costs 2s. 10d.

And if 2 turkeys and 9 fowls cost £2 18s. 6d., 2 turkeys will cost £2 18s. 6d.−(9 × 2s. 10d.)=£2 18s. 6d.—£1 5s. 6d.=£1 13s. $\therefore$ 1 Turkey will cost £1 13s.÷2 =16s. 6d.

(6) Area of field = 13 ac., 81 yds. = 63001 sq. yds.

$\therefore$ One side of field= $\sqrt{63001}$ yds.= 251 yds. $\therefore$ Perimeter of field=251 yds. × 4=1004 yds.

$3\frac{1}{3}$ mls. : 1004 yds. :: 60 min. : required time.

$\therefore$ Required time $=\dfrac{60\times1004}{5866\frac{2}{3}}$min. $=\dfrac{60\times3012}{17600}$min.= 10 min. $16\frac{1}{11}$ sec.

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